COMPLIMENTS OF

THE STATE BOARD OF HEALTH,

OFFICE AT LANSING, MICHIGAN.

TENTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF MICHIGAN,

FOR THE

FISCAL YEAR ENDING SEPT. 30, 1882.

MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
W. S. GEORGE & CO., STATE PRINTERS AND BINDERS.
1883.

Public Health
Gift
Henry F. Vaughan
3-14-44

Office of the Secretary of the State Board of Health,
Lansing, Michigan, December, 1882.

To Hon. DAVID H. JEROME, *Governor of Michigan:*

SIR:—In compliance with the laws of this State, I present to you the accompanying Report for the fiscal year ending September 30, 1882.

Very respectfully,

HENRY B. BAKER,

Secretary of the State Board of Health.

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who is entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

CONTENTS.

ILLUSTRATIONS.

REPORT.

This is the TENTH Annual Report of the Secretary of the State Board of Health, and is for the fiscal year ending September 30, 1882. The first part of the volume, that paged by Roman numerals, contains the Secretary's report of the work of the Board, the Secretary's report of property, including a list of the accessions to the library of the Board both by purchase and by gift, with the names of the donors, abstracts of the proceedings at meetings of the Board, and some special reports, communications, etc. The second part of the volume contains fifty-seven papers, addresses, and reports on different sanitary subjects. Of these, eighteen were presented at the sanitary convention at Ann Arbor, Feb. 28 and March 1, 1882, twenty-two at the sanitary convention at Greenville, April 11–12, 1882. The remaining seventeen articles comprise nine by members of the Board, one by a physician at the Asylum for the Insane, at Kalamazoo, seven prepared in the office of the Board, one from replies by correspondents to circular 50, relative to diseases in Michigan during the year 1881; one from replies by local health authorities to letters from this office concerning communicable diseases, one from reports by the Sanitary Inspectors of the National Board of Health in Michigan from June 1 to Sept. 30, 1882; one from observations furnished by the meteorological observers of the Board; and one from weekly reports of diseases made by regular correspondents and health officers of cities and villages. The articles on "How to Combat Small-pox," "The Sanitary Condition of the Hospitals of the University of Michigan," "Sanitary Condition of Grand Rapids," "The Exclusion of Sewer-Gases from Houses," "Decomposing Organic Matter," "Diphtheria in the Michigan Asylum for the Insane," "Principal Meteorological Conditions in Michigan in 1881," and on "Weekly Reports of Diseases in Michigan in 1881," are illustrated in such a manner as to facilitate understanding the facts contained in them.

The papers are printed, as before, under the following resolution of the Board;—

"*Resolved*, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who is entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein."

The names and postoffice addresses of the members of the Board, and the date of expiration of their terms of office, at the close of the fiscal year are as follows:—

HON. LEROY PARKER, President, Flint, Jan. 31, 1883.

REV. DANIEL C. JACOKES, D. D., Pontiac, Jan. 31, 1883.

Henry F. Lyster, A. M., M. D., Detroit, Jan. 31, 1885.
John H. Kellogg, M. D., Battle Creek, Jan. 31, 1885.
Arthur Hazlewood, M. D., Grand Rapids, Jan. 31, 1887.
John Avery, M. D., Greenville, Jan. 31, 1887.
Henry B. Baker, M. D., Secretary of the Board, and Superintendent of Vital Statistics, Office at Lansing.

STANDING COMMITTEES.

1. Epidemic, Endemic and Contagious Diseases,—Henry F. Lyster, M. D.
2. Sewerage and Drainage,—Henry F. Lyster, M. D.
3. Food, Drink, and Water Supply,—John Avery, M. D.
4. Buildings—Public and Private: Including Ventilation, Heating, etc.,—Rev. D. C. Jacokes.
5. Climate, Geology, Topography, and Vegetation in their Relations to Health,—Arthur Hazlewood, M. D.
6. Disposal of Excreta and Decomposing Organic Matter,—John H. Kellogg, M. D.
7. Poisons, Explosives, Chemicals, Accidents, and Special Sources of Danger to Life and Health,—Arthur Hazlewood, M. D.
8. Occupations, Recreations, and Habits in Relation to Health,—John H. Kellogg, M. D.
9. The Relations of Schools to Health,—John Avery, M. D.
10. Sanitary Survey,—Rev. D. C. Jacokes, Hon. LeRoy Parker, and Henry B. Baker, M. D.
11. The Death-Rate as Influenced by Age, Climate, and Social Condition,—Henry B. Baker, M. D.
12. Legislation in the Interests of Public Health,—Hon. LeRoy Parker.
13. Finances of the Board,—Hon. LeRoy Parker.
14. Mental Hygiene,—Rev. D. C. Jacokes.
15. Diseases of Animals, in their Relation to Public Health,—Henry B. Baker, M. D.
16. The Relations of Preventable Sickness to Taxation,—John H. Kellogg, M. D.

WORK OF THE OFFICE OF THE BOARD, FISCAL YEAR, 1882.

In the following account of the work in the office, the statements of subjects have been grouped, as heretofore, under three heads,—the Collection of Information, the Collation and Evolution of Information, and the Dissemination of Information.

The first head, Collection of Information, includes the asking for, and gathering of, meteorological observations from one class of observers, of weekly reports of prevalent diseases from another class of observers, statistics of outbreaks of diseases from the local health authorities, papers on sanitary subjects by experts, annual reports from local health authorities, etc., etc. Under this head, and as a primary step to some of the work, might come the efforts for the organizing of local boards of health, the securing of the appointment of health officers, and all the pushing and urging necessary to keep the machinery of the sanitary system of the State in the most successful operation. The several classes of persons from whom the material is collected receive more prominent mention in the pages of the Report where their material is used.

The work grouped under the head of Collation and Evolution of Informa-

tion, requires faithful, conscientious, and steady effort to collate, study, and arrive at conclusions new in this new field of science. A vast amount of work, which does not show on the printed page, necessarily has to be accomplished, in order to arrive at the results as printed. This part of the work of the office is important, because of the importance of the subjects regarding which new knowledge is sought to be obtained.

The Dissemination of Information is perhaps as important as its preparation. How best to prepare valuable and instructive information, and then to put it to the greatest possible public use, have been the subjects for continual study.

COLLECTION OF INFORMATION, FISCAL YEAR 1882.

ANNUAL REPORTS BY HEALTH OFFICERS FOR THE YEAR ENDING DEC. 31, 1881.

In January, 1882, a circular (49), after having been approved by the Board, was sent to the health officer of each township, city, and village in the State, about 1,315 in all, transmitting a blank form [I], for their use in making their annual reports to this office. The circular was substantially the same as circular 41 which was sent the year before, and which is printed on pages ix.-x. of the Report of this Board for 1881. The blank form [I] was substantially the same as the blank form [I] used for the annual reports of health officers for 1880, which is printed on pages x.-xii. of the Report for 1881. The circular (49) for 1881 also transmitted a blank for a copy of the record of diseases dangerous to the public health. This blank is printed, reduced in size, on page 271 of this Report.

ANNUAL REPORTS BY CLERKS OF LOCAL BOARDS OF HEALTH, FOR THE YEAR ENDING DECEMBER 31, 1881.

At the same time (January, 1882) the circulars and blank forms were sent to the health officers, a circular (48) asking for a report, and a blank form [J] on which to make a report, were sent to the clerk of the local board of health of each township, city, and village in the State, about 1,315 in all. A blank form for a copy of his record of cases of diseases dangerous to the public health was also sent. The circular and blank form sent to the clerk were similar to those sent the health officer, except that they were not so minute in questions relating to the sickness and deaths. The number of reports received from both health officers and clerks is shown in the following tabular summary:—

TABULAR SUMMARY.—*Number of Annual Reports on Forms [I] and [J], and copies of Records of Cases of Diseases Dangerous to the Public Health, received from Health Officers and Clerks of Local Boards of Health, for the Year ending December 31, 1881.*

BOARD OF HEALTH.	Annual Reports.			Copies of Records of Diseases Dangerous to the Public Health.		
	Total.	By Health Officers.	By Clerks.	Total.	By Health Officers.	By Clerks.
Total	1,143	563	580	629	361	268
Township	1,011	483	528	544	301	243
City	18	14	4	12	10	2
Village	114	66	48	73	50	23

RETURN OF NAMES AND ADDRESSES OF HEALTH OFFICERS OF TOWNSHIPS, CITIES, AND VILLAGES.

In April, 1882, a circular (53) was sent to the supervisors of the townships, presidents and clerks of villages, and mayors and clerks of cities, transmitting a blank form for the return of the name and postoffice address and other facts respecting the persons appointed as health officers. The circular giving the law, as amended in 1881, under which the demand was made, was as follows:

[53.] OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH, *Lansing, Mich., April, 1882.*

DEAR SIR:—Your attention is respectfully asked to the general law relative to Boards of Health in this State, as amended by Act 202, laws of 1881, which amended section, 1693, being section 2 of chapter 46, Compiled Laws of 1871. The amendment is such that the section now applies to all boards of health, whereas before it only named township boards of health, though made to apply to cities and villages by section 1740 as amended in 1879. The section (1693) as amended in 1881 is as follows:

"(1693.) SEC. 2. Every board of health shall appoint and constantly have a health officer who shall be a well educated physician and act as the sanitary adviser, and an executive officer of the board: *Provided,* That in townships where it is not practicable to secure the services of a well-educated and suitable physician, the board may appoint the supervisor or some other person as such health officer. The board of health shall establish his salary or other compensation, and shall regulate and audit all fees and charges of persons employed by them in the execution of the health laws and of their own regulations. Within thirty days after the annual township meeting in each year, the board of health shall meet for the transaction of business, and shall appoint or re-appoint a health officer, and shall immediately cause to be transmitted to the Secretary of the State Board of Health at Lansing, the full name and postoffice address of such health officer, and a statement whether he is a physician, the supervisor, or some other person not a physician. A special meeting of the board may be called by the order of the president or of any two members of said board."

If for any reason a health officer is not appointed immediately, it will then be necessary to appoint one as soon as possible to fill the vacancy; as will also be necessary if the officer appointed does not qualify. Vacancies also occur whenever the incumbent of an office ceases to be an inhabitant of the township, city, or village for which he was elected or appointed an officer.—See section 617, Compiled Laws of Michigan, 1871. The law requires that "every board of health shall * * constantly have a health officer," and provides for calling special meetings, so that there would seem to be no difficulty in complying with the requirement.

If any change of the health officer occurs, or if his postoffice address is changed, it will facilitate our work if your board will cause a notice of such change to be sent to this office.

In addition to his services as sanitary adviser of your local board of health, it is desirable that your health officer correspond freely with this office concerning subjects connected with the public health in your locality. Any important sanitary experience of your board may, if thus reported, be made useful to other boards of health throughout the State. In order that your health officer may act promptly and decisively for the restriction of contagious diseases, it is best to authorize him to proceed immediately when a case of contagious disease within his jurisdiction comes to his knowledge, without the delay incident to calling the board of health together.

The Annual Reports of the State Board of Health have been sent, year by year, to the health officers whose names and addresses have been returned to this office; but when no return of the name and address of the health officer is received no Report is sent, because it is not known to whom to send the Report.

Herewith please find a blank form and printed envelope *for the use of your board in sending to this office the statement of* NAME and POSTOFFICE ADDRESS of your HEALTH OFFICER, and whether or not he is a physician, as required by this law.

Very respectfully,

HENRY B. BAKER, *Secretary.*

Form E, used for townships, is as follows:—

[Please fill every blank, by words or figures, or as directed in the foot-notes. Do not mark out any printed words.]

[E.]

To the Secretary of the State Board of Health, Lansing, Mich.:

SIR:—On the......day of ...., 18.., the Township Board being the Board of Health of the Township of..............................., County of................................, State of Michigan, met for the transaction of business and......* appointed a health officer.

The name of the health officer of this township is...

His postoffice address is..............................., County of..............................., Michigan.

He†............a physician.

He†............the Supervisor of this township.

‡.., Supervisor.

of the Township of...................................;

Postoffice address:..
‡..., Township Clerk,
and clerk of the Board of Health;
Postoffice address:..
This return is made out by§...
Dated at......................................., this......................day of................................, 188...

*If re-appointed, write "re.;" if not, draw a line.
†Insert the word "is," or "is not," as the case may be.
‡It is not essential that more than one of the officers SIGN this return, but it is desirable to have the name and postoffice address of each given. If either officer writes in the name of the other, this fact should appear on this return, so that the officer making the return may be known.
§Insert the words "the Clerk," "the Supervisor," the "Clerk and Supervisor," or otherwise state the facts.

[☞Postage must be prepaid on this return, at letter rate, 3 cents for each half-ounce or fraction thereof.]

A return of a health officer is sometimes received on this blank not fully or properly filled out. In such a case the blank is marked at the points on which further information is desired and again sent to the person who filled it out, for a more complete statement.

Form F, used for cities and villages, is as follows:—

[Please fill every blank, by words or figures, or as directed in the foot-notes. Do not mark out any printed word.]

[F.]

To the Secretary of the State Board of Health, Lansing, Mich.:

SIR,—The name of the Health Officer of this city is...
His full postoffice address is.., County of.........................., Michigan.
He*.........a physician.
He was appointed.., 18...
His term of office expires...
By direction of the†...,
Signed,..., Clerk of the‡...................of..............................
Dated at....................., this...............day of......................................, 188...

*Insert the word "is," or "is not," as the case may be.
†Insert the words "Mayor and Council of the City of........................;" or "Board of Health of the City of...........................," if this appointment is made by the Board of Health and not by the Common Council.
‡Insert the word "City," or "Board of Health," as the case may be.

[☞Postage must be prepaid on this return, at letter rate, 3 cents for each half-ounce or fraction thereof.]

A return of a health officer is sometimes received on this blank not fully or properly filled out. In such a case the blank is marked at the points on which further information is desired and again sent to the person who filled it out for a more complete statement.

There were localities from which no return was received after the first sending of the circular and blank form; to such localities a second copy of the circular was sent, asking for such return. The following shows the total number of health officers returned during the year:—

Health officers of townships	910
Health officers of villages	132
Health officers of cities	37
Total returned in the State	1,079

The delinquent cities from which no return of a health officer in accordance with the law was received up to Sept. 30, are Adrian, Alpena, Eaton Rapids, Lapeer, Mt. Clemens, Muskegon, Negaunee, and Wyandotte.

METEOROLOGICAL REPORTS.

For the fiscal year 1881–1882 there have been received 319 meteorological registers from our regular meteorological observers. Records of certain meteorological conditions in other cities have been received in connection with mortality reports which are elsewhere acknowledged. A statement of the meteorological instruments, received and sent out during the fiscal year is given in the annual report of property.

The names and localities of the observers, and the months from which registers have been received from them in 1881, may be found in Exhibit 7, page 445.

REGULAR CORRESPONDENTS.

During the year 17 correspondents have, by invitation of the Board and their consent, been added to the official list. The total number is now 171. The articles on weekly reports of diseases, and on diseases in Michigan in 1881, are compilations including replies from some of these correspondents.

REPORTS OF DISEASES IN MICHIGAN IN 1881.

In reply to circular 50, 44 correspondents made replies relative to diseases in Michigan in 1881. The circular is printed on pages 282–305, a summary of the replies made in the office of the Board, is printed on pages 283–305, and the replies are printed on pages 305–327 of this report.

WEEKLY REPORTS OF DISEASES IN MICHIGAN IN 1881.

The system of weekly reports of diseases has been maintained during the year, and the compilation of facts gathered from the weekly reports received is printed on pages 513–77 of this volume.

A circular (52) asking for weekly reports of diseases from health officers of cities, under the law was printed and has been sent out to all the health officers of cities who have been returned. The circular is as follows:—

[52.] OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH,
Lansing, Mich.,....................., 188...

To...,

Health Officer of the City of.................. ...., *Mich.*

DEAR SIR,—Under the law requiring reports to the State Board of Health,* this Board has for several years demanded from every health officer of a city in Michigan a weekly report of diseases in his city, on postal-card blanks sent to him for that purpose.

At a meeting of the Board in January, 1882, a resolution was adopted that the demand for weekly reports from health officers of cities, in accordance with the plan heretofore adopted by the Board, be continued in force for all cities in the State.

For your use in making such reports, postal-blanks are sent you by this mail, or have heretofore been sent you, so that it is believed that you have a supply for the current quarter. If you do not receive these please notify me; or if you have not a supply for the quarter, please inform me what blanks will be needed. With the postal-blanks is sent a record-book in which you can, if you choose, preserve for your own purposes a copy of the reports sent to this office with other facts which you may wish to note. A full statement of the plan of marking the reports is printed on the record-book cover. A stamped and addressed envelope, or an addressed postal card, is also sent, on which you may at any time report information not provided for in the postal-blank. Such special reports will be gladly received.

Please acknowledge receipt of the blanks and of this circular on the postal-blank sent for that purpose.

Weekly reports of diseases on such blanks are received by the State Board of Health from a large number of its regular correspondents, who gratuitously contribute them for the public good. It is proper, however, and just, for you to receive for this service compensation from your city board of health, which is required by Sec. 1693, Compiled Laws of 1871, as amended by Act No. 202, Laws of 1881, to fix your compensation, this service being part of the duties of your office as specified in the laws relating thereto.

It is expected that you will begin your reports at once, and that they will be regularly and promptly made. If at any time your supply of blanks should be exhausted, or anything should be likely to occur which might interrupt your reports, please inform me in time to prevent a break in your reports.

By direction of the State Board of Health.

Very respectfully,

HENRY B. BAKER, *Secretary.*

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* Act No. 81, Laws of 1873, Sec. 8.—It shall be the duty of the health physician, and also of the clerk of the local board of health in each township, city, and village in this State, at least once in each year, to report to the State Board of Health their proceedings and such other facts required, on blanks and in accordance with instructions received from said State Board. They shall also make special reports whenever required to do so by the State Board of Health.

BOOKS AND PERIODICALS.

A list of the books and periodicals received by the library of the Board by purchase, exchange, and gift is given in the annual report of property, on page xv. and following pages, together with the names and addresses of the donors.

COMPILATION OF MATERIAL COLLECTED.

The meteorological observations made at this office have been compiled at the end of every week for a weekly report, which is published regularly in the Lansing Republican, and copies of which are sent to the meteorological observers for the Board, and to its sanitary exchanges. The reports of diseases, including the weekly reports by the sanitary inspectors of immigrants at Port Huron and Detroit, have been compiled for a weekly bulletin of sickness, which have been sent for publication to about forty papers in Michigan, and to three or four papers outside the State. Copies of this bulletin have also been distributed with the meteorological reports to sanitary exchanges, to meteorological observers, and to health officers of cities.

The reports received from the meteorological observers of the Board, and from the U. S. Signal Service, have been compiled by months, and annual averages, and averages for all stations represented, have been made. Comparisons have also been made with averages for a period of years. The results of this compilation are stated in tables, diagrams, and exhibits, in an article on The Principal Meteorological Conditions in Michigan in 1881, on pages 444–512 of this Report. The work of compilation, in most cases, involves a correction of the observed tri-daily readings of the barometer for temperature, a reduction of the tri-daily readings of the psychrometer to determine absolute and relative humidity of the air. The weekly reports of diseases have also been compiled by months, to show the relative prevalence, in different months, of the diseases reported. Averages for the year have been made both for the State as a whole, and for several divisions of the State; and from these it has been sought to determine from what diseases there is most sickness, in the State, and in these divisions. A study of relations of sickness from several of the leading diseases to coincident climatic conditions has been made; and there has been made a comparison of reports of these diseases in 1881 with reports of the same diseases for a period of years. Some of the results of this work are presented in diagrams, tables, and exhibits in an article on Weekly Reports of Diseases in Michigan in 1881, pages 513–577 of this Report.

A compilation of replies to a circular of inquiry, sent at the close of the year, 1881, to regular correspondents of the Board, relative to sickness in that year, has been made. This circular contained special questions as to the causation and communication of diseases, and the replies are of value because of their representative character and as illustrating how sickness is occasioned and communicated, and by what means it must be prevented or held in check. The results of this compilation, and the replies, are printed on pages 282–327 on Diseases in Michigan in the year 1881.

Many of the special reports concerning the principal communicable diseases have been compiled and arranged for publication in an article on Communicable Diseases in Michigan during the year ending Sept. 30, 1882, on pages 362–435 of this Report. The compilation, no less than the separate reports, shows the great necessity for prompt and efficient work for the suppression of of these diseases.

Much credit is due to the meteorological observers, to the reporters of diseases and to the regular correspondents for their unpaid contributions of so much valuable material on which the several studies are based.

The weekly reports of the immigrant-inspection service at Port Huron and Detroit, from June 1 to September 30, 1882, have been compiled to show something of the work done by the sanitary inspectors. The compilation is printed on pages 436-443 of this Report. Incidentally the compilation shows the importance of the work, and the need for continuance of the inspection service at those points.

DISSEMINATION OF INFORMATION.

The principal methods of dissemination of information, during the year for which this is a report, were: the distribution of copies of the Annual Reports of the Board for each of the several years 1873 to 1881, inclusive; the distribution of copies of reprints and other small documents published by the Board, about one hundred different documents of that kind having been published, up to the close of the fiscal year 1882; the distribution of copies of the Vital Statistics of Michigan for several years; the holding of a Sanitary Convention at Ann Arbor and one at Greenville; the correspondence of the office in response to questions from local health authorities and others throughout the State, and special suggestions to health officers and others in localities where contagious diseases have occurred; and the issuing of a weekly bulletin of health in Michigan.

The Annual Reports have been distributed as provided in the law "to the officers and members of local boards of health and other persons interested in or laboring for the promotion of the cause of public health."

About eight thousand of the several documents on the preventive management of several of the contagious diseases have been sent to abount five hundred localities where and when one of the diseases was known to be present, under the belief that many persons will then read and act upon the subject who would not take the trouble to do so except under circumstances of danger to their own households. At 290 of those localities, diphtheria was reported, at 150 localities, scarlet fever was reported, and at 61 localities, small-pox was reported present.

There were some copies left of the second edition of the document published by this Board on the restriction and prevention of diphtheria, after Oct. 1, 1881, and the third edition (30,000) were received Dec. 16, 1881. From Oct. 1, 1881, to Oct. 1, 1882, there was distributed of this document about 45,250 copies, in the English language. This document, in the Holland language, was received Oct. 28, 1881, and from that date to Oct. 1, 1882, there were distributed about 3,000 copies. The revised document on the restriction and prevention of scarlet fever, in the English language, was received Nov. 28, 1881, and about 15,000 copies were distributed between that date and Oct. 1, 1882. The document on the prevention and restriction of small-pox was received May 6, 1882, and between that date and Oct. 1, 1882, about 11,500 copies were distributed. Of the leaflet giving general rules for the restriction and prevention of contagious diseases, which was received Nov. 28, 1881, there were distributed between that date and Oct. 1, 1882, about 28,000 copies.

The weekly bulletin of health in Michigan has been sent to a large number of newspapers in Michigan by which it is regularly published.

REPORT OF THE SECRETARY RELATIVE TO PROPERTY, ETC., FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1882.

To the President and Members of the Michigan State Board of Health:

GENTLEMEN:—In compliance with section 5 of Article II. of the by-laws of this Board, the following report of the "nature and amount of property belonging to the Board, which has been received, issued, expended, and destroyed since the last report, and of the property remaining on hand, and also in whose care each item of property is intrusted," is respectfully submitted.

For an account of the instruments and articles of a similar nature, which were on hand at the time of making the last reports, you are respectfully referred to pages xii.-xv. of the Report for 1875, xxvii.-xxxi for 1876, xl.-liv. for 1877, xxxv.-xlviii. for 1878, xix.-xliii. for 1879, xxi.-xxxvi. for 1880, and xviii.-xxxii. for 1881. Since that time articles of this class have been purchased as follows:

One seal of the Board, and press.

Eleven sets Wallaston's Registering Thermometers (maximum and minimum.)

Two psychrometer bulbs.

One thermometer for attachment to barometer.

One air meter.

Two rain-gauges, one second tube for overflow to rain-guage.

Electrotype plates, for the document on the restriction and prevention of scarlet fever, in the German language (eight plates), and in the Holland language (eight plates) and in the English language (eight plates); for the document on the restriction and prevention of diphtheria in the German language (7 plates), in the English language (7 plates); for the revised document on the prevention and restriction of small-pox (16 plates), and in the German language (16 plates), one plate showing proper scarification for vaccination; one cut of the seal of the Board and electrotype of the same; one map of diphtheria outbreak at Fredericville, Crawford county; one plate illustrating a pan water-closet; one plate illustrating ventilation in traps; for document on restriction and prevention of contagious diseases, 2 plates.

One type-writer.
300 seal wafers.
One doz. inkstands.
Fve doz. penholders.
Nine brass-edged rulers.
Three mucilage pots.
Eleven sponge glasses.
One doz. sponges.
Three board clips.
One doz. Faber's ink erasers.
Two rubber stamps.
One stylographic pen.
One pint sperm oil.
Two pairs of shears.
One ruling pen.
Twelve gross steel pens.
Six quarts ink.
Three quarts mucilage.
Forty pounds of twine.
One dozen sheets carbon paper.
Two copying ribbons for type writer.
One bottle anemometer oil.
One Colton's portfolio and scrap book.

Meteorological Instruments have been entrusted to observers, as follows:—

BAROMETERS (one each) to:—

Chas. S. Hampton, Harbor Springs.
J. W. Kimball, Port Austin.
S. E. Wait, Traverse City.
H. T. Calkins, M. D., Petoskey.
W. T. Drake, Marshall.
Carroll E. Miller, M. D., Cadillac.

REGISTERING THERMOMETERS (one set each) to:—

Edwin Stewart, M. D., Mendon.
W. T. Drake, Marshall.
H. T. Calkins, M. D., Petoskey.
Lee S. Cobb, Winfield.
S. E. Wait, Traverse City.
J. W. Kimball, Port Austin.
James S. Reeves, M. D., Niles.
Chas. S. Hampton, Harbor Springs.
Carroll E. Miller, M. D., Cadillac.

Maximum thermometers were placed with F. D. Parmelee of Hillsdale, and L. G. North, M. D., of Tecumseh; and a minimum thermometer was placed with Edwin Stewart, M. D., of Mendon, to replace those broken.

One PSYCHROMETER to J. W. Kimball, of Port Austin.

RAIN-GAUGES to—

Chas. S. Hampton, Harbor Springs.
J. W. Kimball, Port Austin.
E. C. Watkins, Ionia.

One overflow tube for rain-gauge to J. E. Fair, Harrisville.

The instruments in the hands of Orrin Dean, Jr., of Hudson, have been returned, on his removal from the place.

Books and other publications have been received and placed in the library of the Board (during the year ending Sept. 30, 1882), as follows:—

BY PURCHASE:—

Floating Matter in the Air.—Tyndall.
Cause of Color among Races and the Evolution of Physical Beauty.
Working Drawings and How to Make Them.—Haupt.
Bovine Tuberculosis in Man.—Creighton.
A Manual of Histology.—Satterthwaite.
Sanitary Care and Treatment of Children.
Trans. Am. Pub. Health Association, 1881.
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From Powell, Maj. J. W., Washington, D. C.:—
1st Ann. Report of U. S. Geological Survey.
From Pratt, M. D., Foster, Kalamazoo, Mich.:—
Annual Reports Village of Kalamazoo, year ending April 15, 1882.
From Prescott, M. E., Richard, Albany, N. Y.:—
Modern Sanitary Engineering.
From Pritchard, Hon. B. D., Allegan, Mich.:—
Annual Report Mich. State Treasurer, 1881.
From Prudden, Rev. T. P., Lansing, Mich.:—
The Care of Health a Christian Duty.

From Putnam, Mrs. M. L. D., Davenport, Ia.:—
Proc. Davenport Acad. Nat Sciences, Vol. III, Part II.
From Ranney, M. D., Geo. E., Lansing, Mich:—
Trans. Mich. State Med. Society, 1881. No. I., Vol. VIII.
From Rauch, M D., John H., Springfield, Ill.:—
Senate Bill to amend "An act to Prevent the Introduction of Contagious or Infectious Diseases into the United States."
Circulars 60, 66, 80, 81, 82, and others, relative to Vaccination, Care of Small-pox Patients, etc.
Proc. of Meeting No 300 of N. O. Medical and Surgical Association.
Fourth Ann. Meeting, Sanitary Council, Miss. Valley, Cairo, 1882.
Personal Certificate of Vaccination. Illinois State Board of Health.
Blanks for Use in Carrying out Vaccination Order of Ill. State Board of Health.
Resolutions of Ill. State Board of Health relative to quarantine in interior States.
Vaccination of School Children. Cir. 112, 1882.
From Raymond, M. D., J. H., Brooklyn, N. Y.:—
Progress in the management of Contagious Diseases, by Brooklyn Board of Health.
Measles not a Trivial Disease.
From Reeve, M. D., J. T, Appleton, Wis.:—
A Bill for the Better Preservation of the Public Health.
Document on Restriction of Small-pox, Nov. 12, 1877.
Suggestions for the Restriction and Prevention of Small-pox.
From Reeves, M D., J. E., Wheeling, W. Va.:—
An Act Amending and Re-enacting Chap. 150 of the Code of W. Va., concerning the Public Health.
Circulars 2 and 5 and form [3], from W. Va. State Board of Health.
From Regester, M. D., Wilson G., Baltimore, Md.:—
Trans. Med and Chir. Faculty of Maryland, 1882.
From Richardson, M. D, Jos. G., Philadelphia, Penn.:—
Report of Phila. Co. Med. Society on Meteorology and Epidemics for the Year 1878.
"Homeopathy Again." (Reprint from Phila. Med. Times.)
Improved Method of Applying the Micro-spectroscopic Test for Blood-stain.
The Germ Theory of Disease. Reprint from Penn Monthly, Nov., 1878.
Am. Jour. of Microscopy and Popular Science, June, 1881, Vol. 6, No. 6.
From Ridenour, M. D., W. T., Toledo, Ohio.
Ann. Report Health Officer, Toledo, Ohio, 1881.
From Russell, M. D, Jas. B, Glasgow, Scotland:—
Glasgow Health Lectures, No. III, The House.
Census of Glasgow, 1881.
Remarks by Health Officer to Accompany Mortality Tables, 1st, 2d, 3d, and 4th quarters, 1881.
From Secretary of State, Lansing, Mich.:—
Public Acts 1882, Extra Session.
Ninth Annual Report of Births, Marriages, and Deaths, Michigan, 1875.
Local Acts and Public Acts, 1881. 2 vols.
Nineteenth Report Mich. State Board of Agriculture, 1880.
Mich. Crop Reports, Sept. and Oct., 1881, and April, 1882.
From Secretary of U. S. Treasury, Washington, D. C.:—
Quarterly Reports of Chief of Bureau of Statistics, Nos. 1, 2, 3, and 4, 1880-81. No. 2, 1881-82.
From Senate, Michigan Legislature:—
A Bill to Provide for a Board of Health for the City of Detroit.
From Sibley, M. D., A., Augusta, Ga.:—
Trans. Medical Association of Ga., 1881.
From Simons, M. D., Manning, Charleston, S. C.:—
Municipal Report on Artesian Wells, Charleston, 1881.
From Simons, M. D., T. Grange, Charleston, S. C.:—
Annual Reports of Charleston City Registrar, 1865, 1866, 1867, 1868, and 1878.
From Smith, Erwin F., Lansing, Mich.:—
Catalogue of Phaenogamous and Vascular Cryptogamous Plants, Indigenous, Naturalized, and Adventive.
From Smith, M. D., Stephen, New York City:—
The Maritime Sanitary Service of the U. S, and the Relations of National and State Authorities.
From Smith, M. D., W. H., St. Clair, Mich.:—
An Ordinance of the City of St Clair for the Preservation of the Public Health.
Notification of Quarantine by St. Clair Board of Health.
Consumption, Its Causes, Prevention, and Hygienic Treatment.
From Smith, M. D., Wm. Manlius, Syracuse, N. Y.:—
Trans. Medical Society for State of New York for 1881.

From Snow, M. D., Edwin M., Providence, R. I.:—
Report of Deaths in Providence in May, 1882.
Twenty-sixth and Twenty-seventh Annual Reports of Births, Marriages, and Deaths, Providence, R. I., 1880, 1881.
From Speed, M. D., John J., Louisville, Ky.:—
Fourth Ann. Report Kentucky State Board of Health.
From Sproule, B. A., M. D., Robert, Peterboro, Ont.:—
Health and Healthy Homes in Canada.
From Squibb, M. D., Edward R., Brooklyn, N. Y.—
An Ephemeris of Materia Medica, Pharmacy, Therapeutics, and Collateral Information, Vol. I, Nos. 1, 2, 3, and 4.
From Staples, M. D., Franklin, Winona, Minn.:—
Report on Diphtheria in Minnesota.
From State Board of Health, Georgia:—
Second Annual Report of the Board of Health of the State of Georgia, 1876.
From State Board of Health, Lunacy, and Charity, Boston, Mass.:—
Supplement containing Papers on Health, to 2nd Ann. Rept. B'd of Health, Lunacy, and Charity.
From State Board of Health, Springfield, Ill.:—
Third Ann. Report Ill. State Board of Health, with Register of Physicians and Midwives, 1880.
From Stearns, M. D., Henry P., Hartford, Conn.:—
Fifty-eighth Ann. Report Hartford Retreat for the Insane, April, 1882.
From Stevens, M. D., Thad. M., Indianapolis, Ind.:—
Rules and Regulations issued by the Indiana State Board of Health, etc.
The "Essentials" of a Law to Regulate the Practice of Medicine in Indiana.
The Need of Hospitals in Ind. Constructed and Controlled by State Authority.
From Stone, M. D., Henry, Sunny Side, Ark.:—
N. O. Medical and Surgical Journal, July, 1881.
Second Report S. C. State Board of Health, 1881.
From Storer, M. D., LL. D., Horatio, Newport, R. I.:—
The Dangers of Impure Ice.
From Sutton, J. P., Cheboygan, Mich.:—
Resolutions, Rules and Regulations for Care, Restriction and Prevention of Diphtheria, adopted by Benton township board of Health.
Notice of Nuisance and Resolution of Benton Township Board of Health.
From Tatham, M. D., John, Salford, England:—
Salford Health Bulletins, Nos 1, 2, 3, and 4, 1881, and 1, 1882.
From Taylor, M. D., J. Stopford, Liverpool, Eng.:—
Report of the Health of Liverpool During the Year 1881.
From Thomas, M. D., J. R., Bay City, Mich.:—
Burial Permit and Certificate of Death in Use in Bay City.
From Thornton, M. D., G. B., Memphis, Tenn.:—
President's Address before Tenn. State Medical Society, 1882.
3rd Annual Report Board of Health of Taxing District of Shelby County (City of Memphis), 1881.
From Tommasi-Crudeli, Corrado, Rome, Italy:—
La Malaria de Rome et L'Ancien Drainage des Collines Romaines.
Studie fur bonificamento dell Agro Romano, I. L'Antica Fognatura delle Colline Romane.
Etudes sur L'Assainissement de la Campagna de Rome II. Encore on mot sur l'ancien drainage des Collines Romaines. (Avec une planche.)
La Decouverte du Ferment specifique de la Malaria dans le Sang des Fievreux.
From Townshend, M. D., Smith, Washington, D. C.:—
Report of the Health Officer of the District of Columbia, year ending June 30, 1881.
From Trembley, M. D., J. B., Oakland, Cal.:—
Annual Report and Statistics of Meteorology of Oakland, Cal., 1881.
From Turner, M. D., Thos. J., Washington, D. C.:—
Supplement No. 17 to Nat. Board of Health Bulletin, Jan. 21, 1882.
Annual Report National Board of Health, 1879.
From Vandervoort, M. D., John L., New York City:—
111th Report N. Y. Hospital and Bloomingdale Asylum, 1881.
From Van Riper, Hon. J. J., Lansing, Mich.:—
Annual Report of the Attorney General of Mich., 1881.
From Wales, M. D., Philip S., Washington, D. C.:—
Sanitary and Statistical Report of the Surgeon General of the U. S. Navy, 1880.
Prospectus of the Museum of Hygiene, at Washington.
From Walker, Gen. Francis A., Washington, D. C.:—
Census Bulletin No. 271.
Census Bulletin. Population and Males of Voting Age in each County of the U. S.

From Wardner, M. D., H. R., Anna, Ill.:—
1st, 2nd, 3rd, and 4th Biennial Reports Southern Hospital for Insane, at Anna, Ill., 1874-1880.
Report of Commissioners to Construct Southern Ill. Insane Asylum, 1877.
From Waring, Jr., C. E., Col. Geo. E., Newport, R. I.:—
The Separate System of Sewerage. Reprint from Am. Architect, Mar. and Apr., 1882.
Social Statistics of Cities. New Orleans, La., and Austin, Tex.
From Watson, M. D., Irving A., Concord, N. H.:—
Letter to Town Clerks of N. H. from State Board of Health relative to collecting Vital Statistics.
Blank for Names of Persons not Reporting Births and Deaths to Town Clerk.
Blank Marriage Certificate, State of N. H.
Blanks A. B, C, D, and E, for Return of Vital Statistics to State Board of Health.
From Weidman, M. D., W. Murray, Reading, Penn.:—
Report of Board of Health of Reading, 1881.
From Wellings, M. D., J. H., Lansing, Mich.:—
Restriction and Prevention of Diphtheria, and Ordinances of Lansing City.
From Wenzel, M. D., Henry P., Milwaukee, Wis.:—
Is the Obstetric Binder Necessary?
From Whipple, G. W., Richmond, Surrey, England:—
Relative Frequency of Given Heights of the Barometer Readings at Kew Observatory, 1870-1879.
Rate at which Barometric Changes Traverse the British Isles.
Note on a Discussion of Eaton's Table of Barometric Height at London, with regard to Periodicity,
Variations of Relative Humidity, and Thermometric Dryness of the Air with Changes of Barometric Pressure at the Kew Observatory.
Relation Existing Between the Duration of Sunshine, the Amount of Solar Radiation, and the Temperature Indicated by the Black-bulb Thermometer in vacuo.
Relation between the height of the Barometer, the Duration of Sunshine, and the amount of Cloud as observed at Kew Observatory.
Observations of Atmospheric Electricity at Kew Observatory, 1880.
From Wight, M. D., O. W. Detroit, Mich.:—
1st Ann. Report Detroit Board of Health, July, 1882.
Circular from Board of Health to families afflicted with Scarlet Fever.
General Orders Nos. 1, 2, 3, 4, and 5, from Detroit Board of Health.
How to Combat Small-pox.
Report of Health Officer to Detroit City Council on the Pavement Question.
From Wilbur, M. D., C. T., Lincoln, Ill.:
8th Biennial Report Ill. Asylum for Feeble-minded Children, 1880.
From Wilson, M. D., Robert T., Baltimore, Md.:—
A case of Combined Intrauterine and Abdominal Twin Pregnancy.
Annual and Sesqui-Centennial Addresses before the Med. and Chir. Fac. of Md.
Paquelin's Thermo-cautery with Wilson's Anti-thermic Shield, in Epithelioma of the Cervix uteri.
The Thermantidote, or Antithermic Shield.
Ovariotomy during Pregnancy.
From Wingate, Charles F., Brooklyn, N. Y.:—
Practical Points about Plumbing, for Physicians.
Sanitary Tracts issued by Citizens' Sanitary Society of Brooklyn, N. Y. Sanitary Defects of Schools. Treatment of Scarlet Fever. Workingmen and Health. Sewer Gas and bad Plumbing. Hints about Bathing.
Announcement of New York Trade schools, 1881-82.
From Wolf, M. D., T. R., Newark, Del.:—
Agricultural Report of Penn., 1881.
Tabulated Analyses of Commercial Fertilizers.
From Wood, M. D., Thos. F., Wilmington, N. C.:—
Trans. N. C. Medical Society, 1881.
Guide to Shipmasters Visiting Cape Fear and other Rivers. N. C. Board of Health.
Vaccination. Issued by N. C. State Board of Health.
From Woolsey, M. D., E. H., Oakland, Cal.:—
Ann. Report of Health Officer of Oakland, Cal., for 1880.
From Wright, Col. Carroll D., Boston, Mass.:—
13th Ann. Report Mass. Bureau of Statistics of Labor, March 1882,
From Yeomans, M. D., H. P., Mount Forest, Ont.:—
By-law of Mt. Forest, relative to Care of Contagious Diseases.
From Young, Wm., 114 Victoria St., London, Eng.:—
The Political Side of the Vaccination System.
Government Prosecutions for Medical Heresy. "Regina vs. Tebb."
Our Legislators on the Vaccination Question.

Remarks on John Bright's Reply to Geo. Whitehead's Question about Infected Cattle.
Small-pox and Vaccination in London in 1880-81.
Compulsory Vaccination. Speech by P. A. Taylor, M. P.
Vaccination. A Letter to Dr. W. B. Carpenter.
Can Disease Protect Health? Reply to Hart's "Truth about Vaccination"
Vital Statistics Showing Increase of Small-pox, Erysipelas, etc., in Connection with Extension of Vaccination.
To Members of Parliament, relative to "Vaccination Mortality."
Analysis of the Parliamentary Return, entitled "Vaccination Mortality."
The Fable of the Small-pox Hospital Nurses Saved from Small-pox by Revaccination.
Vaccination Opposed to Science and a Disgrace to the English Law.
Vaccination in the Light of History.
Twenty miscellaneous tracts relative to Vaccination.
Vol. V. No. 12, Sept. 1, 1881, National Anti Compulsory Vaccination Reporter.
Remarks on Cattle Plague Vaccination.
Testimonies of Medical Men on the Protection Supposed to be Afforded by Vaccination from 1805 to 1881.
Sanitation, not Vaccination, the True Protection against Small-pox.
Testimonies of Medical Authorities on Vaccination.
Remarks on Certain Medical Principles and Publications.

From ——:—

Congressional Record, July 16, 1882.
Trans. Col. State Med. Society, 1880.
A General Abstract of Meteorological Observations made at Philadelphia, Penn.
Address by W. L. Brayfogle, M. D., President Am. Inst. Homeopathy, Indianapolis, 1882.

Excepting certain publications drawn out by members of the Board and others, the foregoing, together with those accounted for as in the library of the Board, and those drawn out by members and others, at the date of the report for the fiscal year 1881, are in the library and in good condition, save being exceedingly crowded for lack of shelf-room. Those drawn out and not yet (Sept. 30, 1882) returned, are as follows:—

R. C. KEDZIE, M. D.

40th Report of Registrar General of England.

H. O. HITCHCOCK, M. D.

Tract on Prevention of Cholera Infantum and Kindred Disorders. Memoirs on Diphtheria.

REV. D. C. JACOKES, D. D.

Report Mass. B'd of Education on Proposed Survey of the Commonwealth.
Mem. of Am. Pub. Health Ass'n on Legislation Affecting the Public Health.
Circular of Inquiry by Wis. S. B. of H., to School Teachers.
13th Ann. Report Health Dept., Cincinnati, 1879.
Seguin on Idocy.
Superstition and Force. Lea.
Sanitary Engineer, Feb. 15, 1881.

HENRY F. LYSTER, M. D.

Public Health, June 9, 1876. Separate System of Drainage.
Uppingham By-Laws and Regulations on House Drainage.
Plumber and Sanitary Engineer, Oct., Nov., Dec., 1878.
Statements of the Objects of Sanitary Protection Associations of Edinburgh, and Newport, R. I.
Circulars from Mass. S. B. of H., on Drainage and on House Drainage.
Twelve Photographs of Diagrams on Phthisis and Rheumatism.
Playter's Elementary Anatomy, Physiology, and Hygiene.
Wilson's Handbook of Hygiene. Medical News, Feb. 25, 1882.
Cin. Lancet and Clinic, Vol. IX, No. 2, July 8, 1882. Chicago Med. Journal and Examiner, Feb., 1882.
Journal d' Hygiene. June 22, 1882. Sanitary Engineering, London, Dec., 1881.
Mich. Med. News, April 10, 1882. Phila. Board of Health Report, 1876.
London Lancet, April. 8, 1882. La Hygiene Pratique, Sept. 17-24, 1882.

JOHN H. KELLOGG, M. D.

Circular of the Enameled Sanitary Surface Closet.
Report Mass. State Board of Health, 1874.
Life History of Contagium. First and Third Contributions.
Report Building Commissioners of Eastern Mich. Asylum for the Insane, 1877-8.
Am. Med. Bi-Weekly, Aug. 16, 1879, and Jan.-June, 1878.
Am. Journal of Medical Sciences, July-Oct., 1879, Jan., 1882.
Sanitary Record, Jan.-June, 1877, July 15 and Aug 15, 1879.
London Lancet, July-Dec., 1881, Jan. 1881.

Louisville Medical News, Nov. 12, 1881, Apr. 8, 1882.
Can. Lancet, Feb., 1882.
Medical News, Feb. 18, 1882.
Proc. Conn. State Med. Society, 1879.
Med. Record, Jan.-June, 1881, Aug. 13, 1881, Mar. 11, Feb. 11 and 25, 1882.
Western Medical Reporter, Jan., 1882.
Maryland Medical Journal, Vol. VIII.
Chicago Medical Journal and Examiner, Jan.-June, 1880, Jan.-July, 1881.
Cincinnati Lancet and Clinic, Vols. III., V., VI., Jan. 28, 1882.

HENRY B. BAKER, M. D.

Journal d'Hygiene, Sept. 1, 1881. Parasites and Messmates.
Trans. London Med. Chir. Society, Vol. 35. La Hygiene Pratique, July 9-16, 1882.

HON. LEROY PARKER.

An Ordinance Relative to Appointment of Health Officer of West Bay City.
13th Ann. Report Cin. Health Dept., 1879.
Report of Committee of Am. Pub. Health Ass'n on Venereal Diseases.

JNO. AVERY, M. D.

Fifteen Cent Dinners for Families of Six.

JNO. K. ALLEN.

Physiology of Common Life. Lewes. Vol. II. What Young People Should Know.
Flint's Text-book of Physiology. The Atmosphere.

J. R. THOMAS, M. D.

Milk Analyses, by Sharples. Two pamphlets. Trans. Med. Soc. New York. 1860.

MRS. G. W. BEMENT.

Two Lectures on Sanitary Houses.

HON. W. W. ROOT, M. D.

Sanitary Work in Lansing, Mich. Mayor's Address, Aurora, Ill., 1879.

ERWIN F. SMITH.

Floating Matter in the Air. Pop. Sci. Monthly, June, 1882.

WEEKLY OR MONTHLY MORTALITY STATEMENTS.

These reports have been received during the past year, from health officers, registrars, officers of boards of health, or of cities in the United States, and foreign countries, as follows:

Ashmun, M. D., G. C., Health Officer, Cleveland, Ohio.
Atwater, M. D., H. H., Health Officer, Burlington, Vt.
Baldwin, M. D., A. S., Chair. Com. on Vital Statis., B'd of Health, Jacksonville, Fla.
Boyd, Geo., Registrar Vital Statistics, Paterson, N. J.
Boyd, M. D., S. B., Secretary Board of Health, Knoxville, Tenn.
Bradway, M. D., J. R., Health Officer, Oakland, Cal.
Bramble, M. D., L. R., Health Officer, Cincinnati, Ohio.
Brewer, M. D., Charles, Vineland, N. J.
Briggs, M. D., Albert H., Health Physician, Buffalo, N. Y.
Buckley, M. D., Charles, Health Officer, Rochester, N. Y.
Cabell, M. D., J. G., Prest. Board of Health, Richmond, Va.
Carter, A. Robert, Sec'y City Board of Health, Baltimore, Md.
Cheatham, M. D., Richard, Health Officer, Nashville, Tenn.
Cocchi, A., Il Direttore, Dell' Ufficio di Statistica e State Della citter di Roma, Rome, Italy.
Crawford, M. D., A. M., Health Officer, Jackson, Mich.
Day, M. D., Walter De F., Sanitary Supt. and Registrar, New York City.
Det. Kgl. Sundheds Collegium, Copenhagen, Denmark.
Edwards, M. D., Tom O., Health Officer, Wheeling, W. Va.
Fairchild, M. D., M. B., Phy. to Board of Health, Syracuse, N. Y.
Foster, M. D., Eugene, Prest. Board Health, Augusta, Ga.
Fournier, M. D., E. H., Registrar, Mobile, Ala.
Fraser, M. D., E. B., Registrar, Wilmington, Del.
Furnis, M. D., John P., Registrar, Selma, Ala.
Galt, M. D., James D., Health Officer, Norfolk, Va.
Gleason, M. D., M. K., Registrar Vital Statistics, and De Wolf, M. D., O. C., Health Officer, and McVicker, Brock L., Sec'y City Board of Health, Chicago, Ill.
Goldsmith, M. D., W. T., Prest. Board of Health, Atlanta, Ga.
Gordon, M. D., E. W., Prest. Board of Health, Petersburgh, Va.
Hargis, M. D., R. B. S., Health Officer, Pensacola, Fla.
Health Officer, Lowell, Mass.
Hatch, M. D., F. W., Sec'y State Board of Health, Sacramento, Cal.
Horlbeck, M. D., H. B., City Registrar, Charleston, S. C.
Hudson, M. D., H. S., Registrar Vital Statistics, Selma, Ala.

Hunter, W. H, City Sexton, Lansing, Mich.
Hunt, M. D., James G, Health Officer, Utica, N. Y.
Jewett, M. D, Henry S., Health Officer, Dayton, O.
Johnston, Dr. W. H., Registrar, Selma, Ala.
Jones, M D., J. S., Pres., and Herrick M. D., S. S., Sec. State Board of Health, New Orleans, La.
Knight, M. D, A. W., Health Officer, Jacksonville, Fla.
La Rocque, M D., A. B., Medical Health Officer, Montreal, P. Q.
Lindsley, M. D., Walter, Health Officer, Los Angeles, Cal.
Lindsley, M. D, C. A., Health Officer, New Haven, Conn.
Love, Geo. A., Clerk Board of Health, Grand Rapids, Mich.
Luedeking, Dr. Robert, Sec'y Board of Health, St. Louis, Mo.
Martin, M. D., R., Commissioner of Health, Milwaukee, Wis.
Mattocks, M. D., Brewer, Prest. Board of Health, St. Paul, Minn.
McLeod, A. M., M. D K, Surgeon Major, Health Officer, Calcutta, East India.
Means, M. D., T. A., Health Officer and Registrar, Montgomery, Ala.
Meares, M D, J L., Health Officer, San Francisco, Cal.
Miles, M. D., Abijah J, Health Officer, Cincinnati, Ohio.
Nagle, M. D., John T., Deputy Registrar of Records, New York City.
Neal, M. D., Thomas L., Health Officer, Dayton, Ohio.
Park, M. D., J. P., Knoxville, Tenn.
Phelps, M. D., W. C., Health Officer, Buffalo, N. Y.
Ridenour, M. D., W. T., Health Officer, Toledo, Ohio.
Rezner, M D., W. B, Health Officer, Cleveland, Ohio.
Robinson, M. D., C. V., President Board of Health, Petersburgh, Va.
Salisbury, M. D., A. H., Health Officer, Minneapolis, Minn.
Snow, M. D., Edwin M., Supt. of Health, Providence, R. I.
Thornton, M. D., G. B, President, and King, M. D., R. B., Secy. of Board of Health, Memphis, Tenn.
Townshend, M. D., Smith, Health Officer and Registrar, Washington, D. C.
Trembley, M. D., J. B., Oakland, Cal.
Van Pelt, M. D., Chas., Health Officer, Toledo, Ohio.
Wheaton, M. D., C. A., Health Officer, St. Paul, Minn.
Walcott, M. D., H. P., Health Officer, Boston, Mass.
Wellings, M. D., J. H., Health Officer, Lansing, Mich.
Wight, A. M., M. D., O. W., Health Officer, Detroit, Mich.
Woolsey, M D., E. H., Health Officer and City Physician, Oakland, Cal.
Wyckoff, M. D., R. M., Registrar of Records, Brooklyn, N. Y.

The following table shows the amount and kind of hard paper there was on hand at the time of making the last report, the amount purchased during the year, the amount used, and the amount now on hand:—

KIND OF PAPER.	On Hand at Last Report.		Purchased Since Last Report.		On Hand Now.		Used During the Year.	
	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.
Medium	....	....	1	....	....	122	....	358
Folio-post	9	298	13	....	14	401	7	377
Demy	6	222	....	....	....	261	5	441
Crown	7	402	....	....	....	532	6	330
Cover paper	....	219	3	....	2	61	1	158
Manila wrapping-paper	1	262	4	....	1	216	4	46
Blotting-paper	....	93	....	....	....	51	....	39

The hard paper has been used in making blank books for use in the office, circulars, announcements and programs for sanitary conventions, printed letters, writing paper, etc. The cover paper has been used for covers to reprints and record-books for weekly reports of diseases, and wrappers for packages of ozone test-paper.

At the time of making the last report, there were about 1,912 sheets of letter, half-letter and note, 1 ream and 202 sheets of foolscap and legal cap paper on hand. Since that time, there have been purchased: one ream of letter paper, one-half ream of note paper, and one ream of foolscap; and

4,500 sheets of letter, one-half letter and note paper have been made from folio-post paper. There are now on hand about 3,119 sheets of letter, half-letter, and note paper, 1 ream and 228 sheets of foolscap and legal cap. There have been issued to members 650 sheets of letter, half-letter, and note paper. This shows about 3,763 sheets of letter, half-letter, and note paper, and 454 sheets of foolscap and legal cap to have been used in the office.

There were about 67,961 envelopes on hand when the last report was made; 51,000 have been purchased since, making a total of 118,961. There are about 71,429 on hand now, and 2,250 have been issued to members of the Board, showing about 45,282 to have been used in conducting the business of the office.

There was on hand, at the time of making the last report, $206.76 in postage stamps, postal cards, and postal money. Vouchers for postage and box-rent have been allowed during the year to the amount of $1,385.84. There is now on hand in postage stamps, unused postal cards, and postal money $345.68. This shows that during the year the cost of postage and box-rent has been $1,246.92. This does not include $5.35 postage allowed to members of the Board.

Some of the principal items of postage have been as follows:

Distribution of the Report of the Board for 1880	$147.02
Distribution of the Report of the Board for 1881	65.08
Distribution of the Reports of Vital Statistics, 1875 and 1876	134.18
Distribution of the diphtheria document	102.61
Distribution of documents and circulars, 46 (Restriction and Prevention of Scarlet Fever), 47 (Restriction and Prevention of Contagious Diseases), 48 (transmitting Form J to clerks), 49 (transmitting Form I to health officers), 50 (relative to diseases in Michigan in 1881), 53 (demand for return of name of health officer), 54 (restriction and prevention of small-pox), and 55 (relative to work of health officers)	164.88
Sending weekly meteorological, and monthly mortality statements, and weekly bulletin	55.13
Sending ozone test-paper, blank meteorological registers, and return postage	19.54
Sending blanks for weekly reports of diseases, and return postage	18.71
Sending announcements and programs for sanitary convention	12.56
	$719.71

Thus far this report has given exactly or approximately, the kind and amount of property received, on hand, and disposed of by this office during the fiscal year ending September 30, 1882; but in order to show exactly how much has been expended for all property, and for all other expenses during the time specified, the following statement of expenditures is here presented. It includes vouchers numbers 634 to 758 inclusive.

AMOUNT OF EXPENDITURES BY THE STATE BOARD OF HEALTH, AS PER VOUCHERS NUMBERED 634 TO 758 INCLUSIVE.

Chemical Analyses		$30.00
Engraving, Drawing, etc		49.50
Expenses of Members.	Attending Meetings	249.33
	Other Official	272.68
Instruments and Books		811.17
Paper, Stationery, etc		430.86
Postage.	Office	1,385.84
	Members	5.35
Printing and Binding		1,149.19
Secretary		2,000.00
Special Investigations		65.00
Miscellaneous		260.60
Total		$6,709.52

Respectfully submitted,

HENRY B. BAKER,
Secretary.

Having compared the Secretary's report of property received, issued, expended, and destroyed during the fiscal year ending September 30, 1882, with the property book and the record of proceedings, and having examined the foregoing account of expenditures, and compared the same with the books in the Auditor General's Office, I find the same to be correct.

LE ROY PARKER,
Committee on Finances of the Board.

EXPENDITURES BY THE STATE BOARD OF HEALTH IN CALENDAR YEAR 1882.

The appropriation for the Board is made for the calendar year, and cannot exceed $6,000.00. The following statement will show the expenditures by the Board during the calendar year 1882:—

Chemical Analyses		$30.00
Engraving, Drawing, etc.		3.65
Expenses of Members.	Attending Meetings	242.73
	Other Official	316.50
Instruments and Books		760.93
Paper, Stationery, etc.		209.95
Postage.	Office	710.35
	Members	5.85
Printing and Binding		949.31
Secretary		2,000.00
Special Investigations		45.00
Miscellaneous		285.20
Total		$5,559.47

ABSTRACTS AND BRIEF ACCOUNTS OF THE PROCEEDINGS AT THE MEETINGS OF THE STATE BOARD OF HEALTH DURING THE YEAR ENDING SEPTEMBER 30, 1882.

REGULAR QUARTERLY MEETING, OCTOBER 11, 1881.

The meeting was called to order at 9 A. M. by the President, the following members being present during the meeting: Hon. LeRoy Parker, Rev. D. C. Jacokes, Dr. J. H. Kellogg, Dr. Henry F. Lyster, Dr. A. Hazlewood, and Dr. Henry B. Baker. The minutes of the last meeting were read and approved.

The President announced the standing committees of the Board. [The list of committees may be seen on page viii.]

The annual report of property for the fiscal year 1880–1881 was presented by the Secretary and referred to the committee on finance. [It is printed on pages xviii.–xxxii. of the Report for 1881.]

The Secretary read his quarterly report of work in the office, and a résumé of the work of other State Boards of Health.

The revised document on the restriction and prevention of scarlet fever was presented, amended, and approved. [It is printed on pages 211–218 of the Report for 1881.] Dr. Hazlewood presented copies of the document on the restriction and prevention of diphtheria, in the Holland language, and he was requested to have the documents on diphtheria and scarlet fever translated into the German language. It was voted that the documents be stereotyped and 5,000 copies of each document in each language be printed.

The Secretary presented and read a document giving general rules for the prevention and restriction of contagious diseases, which was amended, adopted, and 50,000 copies ordered printed. [It is printed on pages 219-220 of the Report for 1881.]

Blank forms and circulars relative to annual reports of health officers and clerks, and a circular to correspondents relative to diseases in Michigan in 1881 were ordered printed.

The Secretary read a report on work of local boards of health. A vote of thanks was passed to J. P. Sutton, health officer of Cheboygan township, for efficient work in restricting disease.

The Secretary presented an analysis of glucose, by Prof. Sharples of Boston. [Printed in the Report for 1881, pages 242–7.]

A communication from P. R. Phillips, of Ithaca, was read, concerning the overflowed lands on the Maple River, and Dr. John Avery was requested to make an investigation into the subject and report to this Board. [His report is printed on pages 257–261 of this Report.]

Dr. Kellogg spoke of a well in Battle Creek to which had been traced 7 cases of typhoid fever, the water containing organic matter, salts, etc., and the well being surrounded by old privy-vaults.

Dr. Lyster read a paper on Syphilis, which was accepted with thanks and ordered printed. [It is printed on pages 195–200 of the Report for 1881.]

Dr. Jacokes reported on the subject of a sanitary survey. The committee was requested to prepare schedules for the sanitary survey of townships, cities, and villages, and plain directions for filling them up.

Dr. Baker reported on the subject of Diseases of Animals, and he was requested to finish the report, if practicable, in order that it be printed in the Annual Report of the Board.

Dr. Hazlewood reported on the subject of steam boiler explosions, which report was accepted with thanks, and it was ordered printed in the Annual Report. [See pages 279–281 of this Report.]

Dr. Kellogg read a paper on Relations of Preventable Sickness to Taxation, which was accepted with thanks and ordered printed. [It is printed on pages 221–6 of the Report for 1881.]

Mr. Parker reported back a proposed bill to authorize school boards to exclude from school persons infected with or exposed to certain contagious diseases, and unvaccinated persons. It was ordered printed. [It is printed on pages 230–231 of the Report for 1881.]

Mr. Parker reported having compared the annual report of property with the books of the Auditor General's office, and found it correct.

The Secretary was directed to issue a weekly bulletin of sickness in Michigan, to such newspapers and medical journals as will publish it.

Mr. Parker reported his attendance at the meeting of the American Social Science Association, and the report was ordered printed. [It is printed on pages 227–229 of the Report for 1881.]

The Secretary presented the revision of the document on prevention and restriction of small-pox, and it was ordered completed and published in the Annual Report, and electrotyped and 30,000 copies printed for distribution. [It is printed on pages 289–304 of the Report for 1881.]

Dr. Kellogg reported a case of failure in the prosecution for criminal abortion, and said prosecutions must continue to fail until the people were educated to regard the subject differently. Dr. Kellogg and Dr. Hazlewood were requested to prepare a circular on criminal abortion.

Four regular correspondents were approved.

Dr. Baker was requested to attend the meeting of the Am. Public Health Association at Savannah.

Ten thousand additional copies of the document on the restriction and prevention of diphtheria were ordered printed.

Dr. Hazlewood was requested to ascertain the number of Scandinavians in Michigan, with a view of deciding the desirability of translating documents into that language.

Vouchers were allowed.

REGULAR MEETING, JANUARY 10, 1882.

The Board was called to order by the President about 9 A. M., there being present then or during the meeting, Hon. LeRoy Parker, Rev. D. C. Jacokes, Dr. J. H. Kellogg, Dr. A. Hazlewood, Dr. John Avery, and Dr. Henry B. Baker.

The Secretary presented the analysis of two samples of water made at the request of Hon. Perry Hannah, chairman of the Board of Commissioners for the construction of the Northern Asylum for the Insane.

The Secretary presented a report by Hon. Mr. Parker, relative to the verification of diagnoses of diseases dangerous to the public health, which report was accepted with thanks, and adopted as the sense of the Board, and ordered printed in the Annual Report. [The report is printed on pages 254–6 of this volume.]

Dr. Baker presented preambles and resolutions which were adopted, after amendment, as follows:

WHEREAS, It is often difficult to recognize mild cases of diphtheria, or to distinguish such cases from a simple pharyngitis or laryngitis, and

WHEREAS, Such mild cases of diphtheria often communicate a dangerous and fatal form of diphtheria;

Resolved, That it is the duty of physicians and householders in reporting diseases dangerous to the public health, and of local health authorities in their efforts to restrict such diseases, in every case to give to the public safety the benefit of the doubt;

Resolved, That suspected cases of dangerous diseases should be reported, and precautionary measures should be taken.

Dr. J. H. Kellogg and Dr. John Avery were appointed a special committee to report on the present knowledge respecting diphtheria, and the committee was authorized to issue a circular.

Circulars 34 and 35 were referred to the president and secretary for amendment and reprinting, and 10,000 copies were ordered printed. [Circular 35 was amended and printed as circular 55 on pages 262–273 of this Report.]

The demand on health officers of cities for weekly reports of diseases was continued in force.

Dr. Lyster was requested to prepare a paper on the present knowledge of typhoid fever.

Mr. Parker's report on tearing down placards of diseases dangerous to the public health was ordered printed. [It is printed on page 251 of this Report.]

The president, secretary and Dr. Lyster were appointed a committee to prepare a plan for the inspection of immigrants *in transit* and secure a certificate from the Governor that there were in this State no available funds to pay for such inspection, and submit such plan and certificate to the National Board of Health.

The committee on sanitary conventions was authorized to make all arrangements for a sanitary convention in the western part of the State.

An opinion by Mr. Parker relative to the salaries of health officers, etc., was ordered printed. [It is printed on pages 252-3 of this Report.]

Dr. Avery read a report on the overflowed lands along the Maple River, which report was accepted with thanks and ordered published in the Annual Report. [It is printed on pages 257-261 of this Report.]

Dr. Hazlewood reported relative to action to prevent death from poisoning by opium. [It is printed on pages 277-278 of this Report.] He also recommended a committee to prepare a circular on the subject of antidotes to poisons. Dr. Hazlewood and Dr. Kellogg were appointed as such a committee.

Dr. Hazlewood reported, relative to the safety of hotels at summer resorts,

that the present law was sufficient. Dr. Baker thought its execution should be placed in the hands of the local boards of health. The subject was referred to Mr. Parker.

Dr. Baker presented a preamble and resolution relative to the overflowed lands adjacent to Maple River, which was amended and adopted. [It is printed on page 260 of this Report.]

Eight persons were approved as regular correspondents.

The secretary read a report of work by local boards of health and a résumé of work by other State boards of health.

Vouchers were allowed.

SPECIAL MEETING AT ANN ARBOR MARCH 1, 1882.

The special meeting was held in accordance with a call from the president. There were present: Hon. Le Roy Parker, Rev. D. C. Jacokes, Dr. J. H. Kellogg, Dr. A. Hazlewood, Dr. Henry B. Baker.

The secretary presented a letter from Dr. John J. Speed, the president of the Sanitary Council of the Mississippi Valley, asking this Board to express its opinion as to the inspection service by the National Board of Health to guard the entrance to the Mississippi Valley.

Dr. Baker presented a preamble and resolutions relative to this subject, which were adopted, as follows:

WHEREAS, The prevention of the introduction of yellow fever into the United States is a subject of national importance;—

Resolved, That, in the opinion of this Board, it is proper for the Louisiana Board of Health to ask, and it is the duty of the National Board of Health to continue to give aid in the prevention of the introduction of yellow fever into the Mississippi Valley;—

Resolved, That, because of the duties of the National Board of Health in aiding the prevention of the introduction of yellow fever, and in giving accurate information to all States interested in the sanitary condition of the Mississippi Valley,—1. An Inspector of the National Board of Health should be placed at Eadsport, to act conjointly with the officer of the State Board of Health in securing the exclusion of infected vessels from the Mississippi River, and in notifying such vessels that they must be thoroughly disinfected. 2. That a representative of the National Board of Health should be stationed at the Mississippi River Quarantine Station. 3. That it is the duty of all health authorities in Louisiana, and in the Gulf States, promptly to communicate to the National Board of Health any and all possible information relative to the occurrence of yellow fever, or of a case which may be suspected to be yellow fever, and in every possible way to aid the National Board of Health to perform its duties in giving accurate information for the guidance of State and other Boards of Health throughout this country.

Dr. Baker then presented the following preamble and resolutions, which were adopted:

WHEREAS, Measures for the prevention of the introduction of diseases from foreign countries into the United States are of national importance, affecting not only the Seaboard and Gulf States but also States in the interior, as evidenced a few years since by the widespread disaster from yellow fever, and recently by the wide diffusion of imported small-pox; therefore—

Resolved, That in the judgment of this Board, such measures should be continued by the National Board of Health, and undertaken by the United States Government, as will best and most effectually prevent the introduction of diseases into the United States;

Resolved. That our Senators and Representatives in Congress be, and they hereby are, respectfully and earnestly requested to use their influence toward securing any appropriate legislation which may be necessary to this end.

Vouchers were allowed.

REGULAR MEETING, APRIL 11, 1882.

The regular meeting was held in the common council room in the city of Greenville, on account of the sanitary convention in that city at that time.

Rev. D. C. Jacokes was chosen President *pro tem.*, the following members

being present: Rev. D. C. Jacokes, Dr. J. H. Kellogg, Dr. A. Hazlewood, Dr. John Avery, and Dr. Henry B. Baker.

William Oldright, A. M., M. D., Chairman of the Provincial Board of Health of Ontario, and J. J. Cassidy, M. D., member of the same Board, were invited to be present during the meeting. Dr. Oldright thanked the Board, and accepted the invitation for himself and his colleague.

Eleven persons were approved as regular correspondents.

The Secretary was requested to represent the Board at the meeting of the Sanitary Council of the Mississippi Valley, at Cairo, Ill., where the subject of immigrant-inspection will come up.

Dr. Oldright spoke of the necessity for immigrant-inspection, and of the willingness of the Provincial Board to coöperate as far as in their power.

The Secretary was instructed to correspond with the health authorities of the Dominion of Canada, and of the several provinces thereof, and of municipalities where such health authorities exist, asking their coöperation in the proposed immigrant-inspection service.

Vouchers were allowed.

Dr. Hazlewood presented a report of the special committee to prepare a document on the prevention of deaths by poisoning, which report was accepted with thanks, and the committee given power to amend it before publication. Dr. Hazlewood also presented a report on lead-poisoning by the use of a nursing-bottle. The Secretary was instructed to write to the manufacturer of the bottle, informing him of the danger of using a lead sinker, and requesting a change. The report was ordered published in the Annual Report. [It is printed on pages 277–279 of this Report.]

The circular 35 revised was presented by the Secretary, discussed, changed, accepted, and 20,000 copies ordered printed for distribution. [It is printed on pages 262–273 of this Report.]

Dr. Kellogg, special committee, presented a circular on criminal abortion. The report was accepted and the committee continued.

Dr. Kellogg was requested to represent the Board at the meeting of the American Medical Association at St. Paul, Minn.

SPECIAL MEETING, MAY 18, 1882, AT PORT HURON.

In response to a call by the President, a special meeting of the Board was held at Port Huron, May 18, 1882, to consider any business which might come before it, in connection with the meeting of representatives of various boards of health, relative to the immigrant-inspection service. There were present: Hon. LeRoy Parker, Rev. D. C. Jacokes, Dr. John Avery, and Dr. Henry B. Baker. The President and members took part in the general meeting, and at a special meeting of the Board alone, vouchers were allowed, and business transacted with reference to the inspection-service.

SPECIAL MEETING, JUNE 22, 1882, AT LANSING.

In pursuance to a call by the President, the Board met the State Board of Charities at the State Reform School, at Lansing, to consider plans for proposed new buildings at the Reform School. A detailed account of the proceedings at this meeting may be found on pages 339–341 of this volume. A separate meeting of the Board was afterwards held and vouchers were allowed.

REGULAR MEETING, JULY 11, 1882, AT LANSING.

The Board was called to order by the President at 9 A. M., there being present Hon. LeRoy Parker, Rev. D. C. Jacokes, Dr. Henry F. Lyster, Dr. John

H. Kellogg, Dr. John Avery, and Dr. Henry B. Baker. The minutes of five preceding meetings (held Jan. 10, March 1, April 11, May 18, and June 22, 1882) were read and approved.

The rules were suspended, and the subject of the danger to the National Board of Health was taken up. It was voted to send telegraphic memorials to Senators Ferry and Conger, which was done. The Secretary was directed to prepare a further memorial to Congress asking for the proper maintenance of the National Board of Health, which memorial should be signed by the President of the Board.

Mr. Parker read an account of the small-pox outbreak at Flint. He was requested to complete it after the close of the outbreak. [It is printed on pages 401–403 of this Report.]

Dr. Lyster gave a verbal report of his connection with that outbreak, and he was requested to reduce it to writing for the Annual Report. [It is printed on pages 397–401 of this Report.]

Dr. Kellogg read a report of the committee on the construction of a superintendent's cottage at the Reform School, which was accepted with thanks and ordered printed. [It is printed on page 342 of this Report.] Dr. Kellogg's report was adopted as the sense of the Board, and a copy was ordered to be sent to the Board of Control of the Reform School. Dr. Kellogg reported the details of changes recommended by the committee in the new double cottage to be erected at the Reform School; the report was accepted and ordered printed. [It is printed on pages 341–2 of this Report.] Dr. Kellogg presented, as member of the committee, a proposed circular relative to diphtheria, and the committee was authorized to complete the circular and issue it.

Unpaid voucher 692 was cancelled.

The Secretary read a résumé of the work of other State Boards of Health. Five persons were approved as regular correspondents.

An invitation to hold a sanitary convention at Pontiac was accepted, and an invitation to hold one at Reed City was accepted on the condition that one was not held at Muskegon.

Dr. Lyster introduced a resolution, which was amended and adopted, as follows:

WHEREAS, It is essential to the health and well-being of the people that all articles of food offered for sale shall be free from adulteration;

***Resolved,* That the sum of one hundred and fifty dollars is hereby appropriated for the purpose of analyses and reports by experienced chemists, on such articles of food as may be submitted by the officers of this Board. This appropriation being for the year 1882.**

The Secretary was authorized to have made analyses of tissues, excretions, and secretions of the human body, in aid of the determination of the cause of disease, the expense not to exceed one hundred dollars.

Vouchers were allowed.

Dr. Lyster read an introduction to a paper on the present knowledge of typhoid fever, which was accepted with thanks, and he was requested to complete the paper.

Dr. Avery reported his attendance on the meeting of the Ontaria Medical Society, which report was accepted with thanks and ordered printed. [It is printed on pages 274–6 of this Report.] Dr. Avery, as member of the committee, reported the examination of workshops at the Ionia House of Correction. The report was accepted. [It is printed on page 343 of this Report.]

Mr. Parker was requested to attend the public health section of the American Social Science meeting at Saratoga. [An account of the subjects at this meeting is printed on pages 328–338 of this Report.]

The examinations in sanitary science were postponed until the October meeting.

SPECIAL MEETING, AUGUST 15, 1882, AT DETROIT.

The Board met at the call of the President, at the Russell House, Detroit, on August 15, to consider plans for the new asylum for the insane at Traverse City. There were present: Hon. Le Roy Parker, Rev. D. C. Jacokes, Dr. Henry F. Lyster, Dr. John H. Kellogg, Dr. John Avery, and Dr. Henry B. Baker. There were present Hon. Perry Hannah, and other members of the Board of Commissioners for the construction of the asylum, the architect, and the superintendent of construction, who explained the plans submitted, which were not complete, but showed the ground plans; elevations; arrangement of buildings and of rooms; air-inlets to buildings, halls, and rooms; air-outlets in rooms, and in garrets to the outer air; and a few points respecting the soil-pipes and drains. It was stated that air was to be supplied to the buildings by means of a fan, which would be used whenever the superintendent considered it necessary. After examination of the plans, a committee was appointed consisting of Dr. Henry B. Baker, Rev. D. C. Jacokes, and Dr. J. H. Kellogg; and the committee was directed to prepare and transmit to the President of the board of construction a written report of the views of this Board in relation to the plans thus far submitted and explained.

The committee was directed to visit and examine the Eastern Asylum for the Insane, at Pontiac.

IMMIGRANT-INSPECTION SERVICE.

This Board has long been laboring for the restriction and prevention of contagious diseases in Michigan. It has become apparent that progress in this direction in one locality is difficult, not to say impossible, or at least hinges greatly on progress in other localities; and this is true not only of localities in the State but applies with nearly the same force to localities outside the State, from which travel and other means of intercommunication are constantly going on. The effort for the prevention and restriction of disease must be supported by efforts for the exclusion of disease from the State. During the year, systematic efforts have been put forth with a view to tracing outbreaks of diseases to their source, and not only to their source in the State, but the manner of their introduction into the State. The success in tracing the introduction of diseases has been great. Quite a number of outbreaks have been traced. It has been ascertained that other diseases than small-pox are being constantly introduced. The State alone has not been able to act in a very comprehensive manner for the exclusion of communicable diseases, but by the aid of the National Board of Health a system of inspection of immigrants has been established, which has already done much to supply knowledge as to modes of introduction of disease and best means of excluding disease. Although the National Board of Health is temporarily embarrassed by a lack of means and the immigrant-inspection service is temporarily suspended thereby, it is hoped that the service will be resumed and carried on without cessation and with good results.

ABSTRACTS OF SPECIAL REPORTS, COMMUNICATIONS, ETC.

Dr. James Hueston, of Northville, reported cases of diphtheria associated with bad sanitary conditions, such as surface-water and filth being washed into the well, bad ventilation, over-crowding; and the cessation of the disease

after moving the family out of the house, cleaning the well, disinfection of the house, and a general overhauling of the whole premises. Dr. Hueston also communicated an interesting account of the immunity from diseases among the residents of certain islands in the Pacific ocean, where the primitive methods of life are such as to make the sanitary condition remarkably good, and compared this condition and the results with facts as observed by him at Honolulu, where the sanitary arrangements are as yet by no means perfect, and the death-rate from certain diseases is great,—this report being based on facts coming under his observation while making a tour of the Pacific Islands.

C. V. Beebe, M. D., of Manistee, called attention to the injury to children by keeping them too long in school, and reported several cases of incontinence of urine which he believed were due to this cause.

The clerk of the township of Campbell, Ionia Co., reported that their board of health proposed to allow each physician twenty-five cents for each report of a case of disease dangerous to the public health, and eight cents per mile one way for traveling fee.

S. L. Hicks, of Boyne Falls, reported the experience of his inability to secure the abatement of a nuisance in his vicinity, the health officer claiming it was not his duty to abate it, and the prosecuting attorney claiming it was not his duty to attend to it.

A letter from Lewis Bush of Hesperia, Oceana Co., sets forth the fact of the exposure of the bottom of the stream and the flooding of the river by persons who make money out of the lumbering business, and to the detriment of the health of the people of the locality. A letter from Dr. H. C. Hawley, supervisor and health officer of the same township, on the same subject, said the matter concerned two counties and is a grevious nuisance, flooding lakes, swamps, etc., over a large area of country.

A. C. Taylor, M. D., of Manchester, reported a disease among children, like cholera infantum, occurring in February, 1882.

W. H. Wagner reported an epidemic of conjunctivitis (sore eyes) in March, 1882.

A. F. Hagadorn, M. D., of West Bay City, reported the prevalence of typho-malarial fever in March, 1882.

R. F. Stratton, M. D., of St. Joseph, on May 18, 1882, urged the special study of neuralgia in relation to meteorological causes.

A. A. Dunton, Jr., M. D., of Jerome, Hillsdale Co., reported a peculiar tendency to heart troubles, June 24, 1882.

M. W. Gray, M. D., then of Nonesuch, Ontonagon Co., reported cases of a disease of a typhoid character, chills and diarrhea; only one of 22 recorded cases showed any tendency to brain trouble.

Wm. Worsfold, M. D., of Jackson, in July, 1882, notices cerebro-spinal symptoms associated with intermittent fever.

J. W. Mason, M. D., of Dundee, reported unusual conditions of health in that vicinity, July 26, 1882.

R. F. Stratton, M. D., of St. Joseph, on July 31, 1882, reported the absence of the bowel complaints usually prevalent in that season of the year.

The Supervisor of Convis township, Calhoun county, in August, 1882, stated in response to a request from this office that that township has appointed a health officer, never having had a health officer before.

L. S. Stevens, M. D., of Muir, on Aug. 1, 1882, reported that he had

noticed a remarkable development of nervous symptoms in sickness, due, in his opinion, to malarial influences.

Bion Whelan, M. D., of Hillsdale, reported on Sept. 4, 1882, a case of sporadic cholera, accompanied by rice-water discharges, cramps in extremities, collapse and death.

H. W. Marsh, M. D., of Chesaning, reported a "well-marked case of sporadic cholera" Sept. 17, 1882. The patient had recently returned from a trip through the West and South, and stopped at Chicago a short time.

N. W. Andrews, M. D., of North Muskegon, reported that dysentery had been very prevalent for 3 or 4 weeks, Sept. 18, 1882.

This TENTH ANNUAL REPORT is respectfully submitted.

HENRY B. BAKER,
Secretary.

PROCEEDINGS AND ADDRESSES

AT THE

SANITARY CONVENTION,

AT ANN ARBOR, MICHIGAN,

HELD UNDER THE AUSPICES OF THE

STATE BOARD OF HEALTH,

AT THE COURT HOUSE, FEB. 28 AND MARCH 1, 1882.

SANITARY CONVENTION AT ANN ARBOR.

For this convention the following circular of announcement was issued:

SANITARY CONVENTION AT ANN ARBOR, MICHIGAN, UNDER THE AUSPICES OF THE STATE BOARD OF HEALTH.

In accordance with invitation received from citizens of Ann Arbor, arrangements having been made by a local committee of citizens of Ann Arbor, acting with a committee of the State Board Board of Health.

TIME AND PLACE.

You are cordially invited to be present at the sessions of a Sanitary Convention which will be held in the city of Ann Arbor, Michigan, on February 28 and March 1, 1882.

SESSIONS.

There will be sessions the first day at 3 P. M. and 7:30 P. M.; on the second day at 9:30 A. M., 2:30 P. M., and 7:30 P. M.

During each session of the convention there will be one or more addresses or papers on some subject of general interest pertaining to public health, each paper to be followed by a discussion of the subject treated.

OFFICERS OF THE CONVENTION.

The officers chosen by the committee are as follows:—
President, Justice T. M. Cooley.
Vice-President, W. F. Breakey, M. D.
Vice-President, Judge W. D. Harriman.
Vice-President, Hon. Israel Hall.
Vice-President, Mr. C. H. Worden.
Vice-President, Mr. H. J. Brown.
Vice-President, Mr. Richard Hudson.
Secretary, V. C. Vaughan, M. D.

EXHIBITION OF SANITARY APPARATUS.

Manufacturers of and dealers in all kinds of sanitary apparatus or appliances are invited to send specimens of their articles for exhibition at this convention in accordance with the following regulations:

(*a*) The committee reserves the right to decline any article not deemed suitable.

(*b*) A full description of each article proposed to be exhibited must be forwarded to the secretary of the convention with the application for space.

(*c*) There will be no charge to exhibitors for entrance-fee or for floor or wall space.

(*d*) Exhibitors will pay all expenses of transportation, storage, placing and removal of goods, and must themselves be responsible for any breakage or damage to their articles.

(*e*) Every article, model, drawing, or photograph exhibited must bear a descriptive label giving a detailed statement respecting its construction, use, and the price at which it can be furnished, and the name and address of the agent, and place of sale.

(*f*) Exhibitors may employ persons to explain their exhibits, and properly to solicit orders.

(*g*) The position in the hall, of articles entered by each exhibitor, will be determined by the secretary of the convention.

(*h*) Exhibits will be received by the secretary of the convention until February 27, 1882, and will be placed in the hall before the opening session of the convention.

Judges will be appointed to examine the various articles on exhibition, and certificates of merit will be awarded to such articles as are deemed worthy.

Records of the proceedings of this convention and some of the addresses and papers will probably be published in the Annual Report of the State Board of Health.

The papers read are expected to be original contributions, which when read are the property of the convention, and should be left with the secretary.

The admissions to all sessions of this convention will be free, and the public are cordially invited. Programs for the sessions of the convention will be issued at an early day.

ADDRESSES AND SUBJECTS TO BE PRESENTED AND DISCUSSED.

1. Welcoming address, by the Mayor, Dr. Kapp.
2. Address by the president of the convention, Justice Cooley.

Among the subjects to be presented and discussed are the following:

1. Ventilation.
2. Causes of Insanity.
3. Injuries to Health from Overflowed Lands and from Mill-dams and other Obstructions in Rivers.
4. Water-supply and Disposal of Waste Matter.
5. School Life and Hygiene.

COMMITTEE FROM THE STATE BOARD OF HEALTH.

Rev. D. C. Jacokes, Pontiac; J. H. Kellogg, M. D., Battle Creek; Henry B. Baker, M. D., Lansing.

LOCAL COMMITTEE.

W. F. Breakey, M. D., T. J. Keech, Judge W. D. Harriman, Judge Cooley, J. Kapp, M. D., Israel Hall, O. Eberbach, Prof. Prescott, Philip Bach, Hon. E. D. Kinnie, Prof. Olney, Dr. George.

Further information may be obtained by addressing either of the following members of the sub-committee: W. F. Breakey, M. D., Ann Arbor, Mich.; Henry B. Baker, M. D., Lansing, Mich.; V. C. Vaughan, M. D., Ann Arbor, Mich.

V. C. VAUGHAN, M. D.,
Secretary.

PROGRAM OF THE SANITARY CONVENTION TO BE HELD AT THE COURT HOUSE, ANN ARBOR, MICHIGAN, TUESDAY AND WEDNESDAY, FEBRUARY 28 AND MARCH 1, 1882.

First Session.—Tuesday, February 28, at 3 P. M.

1. Convention called to order by the Secretary.
2. Prayer—By Rev. Wyllis Hall, of Ann Arbor.
3. Address of welcome—By Hon. J. Kapp, M. D., Mayor of the city.
4. Introductory Remarks; Statement of purposes of the convention, by Hon. Le Roy Parker, of Flint, President of the State Board of Health.
5. Address—What the Law can do for the Health of the People, by Justice T. M. Cooley, LL. D., President of the convention.
6. A paper—Hygiene of the Eye, by Prof. C. J. Lundy, M. D., of Detroit.
7. Discussion of the subject.
8. A paper—Ventilation of Basements, Filth, Disease-Germs, etc., by A. F. Kinne, M. D., of Ypsilanti.
9. Discussion of the subject.

Second Session.—Tuesday Evening, February 28, at 7:30.

1. Reading minutes of the previous session.
2. A paper—The Care of Health a Christian Duty, by Rev. T. P. Prudden, of Lansing.
3. Discussion of the subject.
4. A paper—How to Combat Small-pox, by O. W. Wight, M. D., Health Officer of Detroit.
5. Discussion—Five minute speeches.
6. A paper—The Ambulance Hospital for Small-pox in Cities, by Prof. Henry F. Lyster, A. M., M. D., of Detroit.
7. Discussion of the subject.
8. Appointment of committees.

Third Session.—Wednesday, March 1, at 9:30 A. M.

1. Reading of minutes of previous session.
2. Prayer—By Rev. W. H. Ryder, of Ann Arbor.
3. A paper—The Purification of Water by Freezing, by C. P. Pengra, M. D., of Ovid.
4. Discussion of the subject.
5. A paper—School Life and Hygiene, by W. F. Breakey, M. D., of Ann Arbor.

6. Discussion of the subject of school life and hygiene, by Prof. W. S. Perry, Rev. W. H. Ryder, Judge Cheever, and others.
7. A paper—Hygiene and the Clerical Profession, by Rev. Geo. Duffield, D. D., of Lansing.
8. General discussion.

Fourth Session.—Wednesday, March 1, at 2:30 P. M.

1. Reading of minutes of previous session.
2. A paper—Report of Analyses of Samples of Milk.
3. General discussion.
4. A paper—Water-Supply, by Hon. Azel Ames, Jr., M. D., Secretary American Public Health Association, of Boston, Mass.
5. Discussion of the subject of water-supply, by Prof. A. B. Prescott, M. D., F. C. S., of Ann Arbor.
6. A paper—By R. Humphrey Stevens, M. D., of the Grand Rapids Sanitary Association.
7. Discussion.

Fifth Session.—Wednesday Evening, March 1, at 7:30.

1. Reading of minutes of previous session.
2. Miscellaneous business, reports of committees, resolutions, etc.
3. A paper—Utilizing the Press for Sanitary Objects, by W. L. Eaton, editor of the Kalamazoo Daily Telegraph.
4. Discussion of the subject.
5. A paper—Ventilation, by Prof. John W. Langley, S. B., M. D., of Ann Arbor.
6. Discussion of the subject.
7. A paper—Some Meteorological conditions affecting Ventilation, by Prof. M. W. Harrington, A. M., of Ann Arbor.
8. General discussion.
9. Closing of the convention.

FIRST SESSION, FEBRUARY 28, AT 3 P. M.

The convention was called to order by the secretary, and prayer was offered by Rev. Wyllis Hall, of Ann Arbor. A brief address of welcome was made by Hon. John Kapp, M. D., mayor of the city of Ann Arbor. Hon. Le Roy Parker, of Flint, President of the State Board of Health, then stated the purposes of the convention in an introductory address as follows:—

INTRODUCTORY ADDRESS.

BY HON. LE ROY PARKER.

The present convention is the fifth that has been held in this State under the auspices of the State Board of Health. The interest manifested in previous conventions—an interest which has certainly increased with each one held—gives assurance that they are performing an important part in directing the attention of the people to sanitary matters.

The chief aim of sanitary work is to lead the masses of people to adopt such method of living for themselves, and to compel it in others, as shall permit the smallest possible percentage of disease and death to prevail. In order to do this most effectually we must all become thinkers and doers in this direction. It is not enough that a few men shall devote their lives to the elaboration of theories of prevention of disease. It is not enough that books and pamphlets shall be printed telling us how we may best ventilate and heat and drain our houses, or how we may ward off the infection that so often assails us; but it is primarily essential to the most perfect condition of public health, that the theories of scientists, the plans and methods of experienced sanitarians shall be brought directly home to the attention of every man and woman in such simple form that they may easily comprehend them, and understandingly apply them to their own ways of living. People should be so led to interest

themselves in sanitary matters that they will become familiar with the common rules of sanitation; that the principles of healthy living will become as much a study in the family circle as are the principles of household art; that the appliances which are found to be best adapted to the requirements of healthy homes shall be as much a subject for consideration as are the objects of beauty with which we decorate our houses. The statues, the pictures, the numberless forms of beauty with which we idealize our homes, appeal in vain to the heart of him whom malaria has marked for its victim.

It is for the purpose of popularizing sanitary science, that these conventions are held from time to time in various parts of the State. It is for the purpose of gathering together as many of all classes and professions as possible,—not doctors alone,—but lawyers, ministers, merchants, farmers, and mechanics, that they may listen to those of their number who have something to say, and discuss together the subjects presented; and each and all are earnestly desired to lend a hand, and put into the common stock such facts, ideas, and experiences upon sanitary matters as they may be able to contribute.

Herbert Spencer in his "Social Statics," opposed the enactment of sanitary laws and the creation of boards of health, on the ground that they interfered with the natural evolution of sanitary progress, but insisted that such progress could be accomplished only by promoting the diffusion of sanitary knowledge among the people by lecturing, teaching, and publishing this knowledge, until it becomes so general that all men will voluntarily do for themselves and others, that which shall best preserve the public health. We cannot but disagree with Spencer's idea of the inefficacy of sanitary laws and boards of health, but we heartily commend his view of the necessity for a widespread and universal dissemination of sanitary knowledge among the people. Our State Board of Health is doing just that kind of work,—that of preaching, lecturing, publishing, and holding conventions by which knowledge of sanitary matters is being universally diffused among the people of the State. The papers read at this convention, and the discussion of the questions presented, will be published and distributed in every township in Michigan, and cannot fail to exert an influence in stimulating popular thought in this direction.

Another object in holding such conventions is that public attention may be more particularly directed to those causes of disease and death, which new and ever varying conditions of life are continually creating. The tables of mortality of to-day show many deaths from causes which were practically unknown fifty years ago. Our fathers rarely left this world by the explosion of a steam-boiler, but the marvelous multiplication of uses to which steam is now applied has increased to a frightful extent the number of casualties from this cause alone. Our morning papers give us day after day accounts of explosions on vessels or cars, in our steam-heated houses, in mills, factories, and furnaces, in the heart of our large cities, where the wheels of every industry are driven by this motor, and in the peaceful quiet of the country where the old horse-power has given way to the steam-thresher. The accounts vary but little in detail, it is only the names of the killed and wounded that differ. It is always weak iron or an inefficient engineer that is to blame.

Let the people speak through these conventions and demand from their representatives a law which shall compel an inspection of the iron and the engineers, and our mortality tables will show fewer deaths from the explosion of steam. I need not multiply instances of the causes of death which might

be prevented if the people would insist upon proper legal enactments for their prevention, or upon the efficient enforcement of the laws already provided. If the public can be made to feel that the interests of health are paramount to all others and that its rights in this respect are superior to the interests of trade, commerce, and manufacture, it will no longer tamely submit to the various forms of nuisance which endanger life and health by contaminating the air we breathe, the food we eat, and the water we drink.

If the public are led to understand the extent of the ravages of preventable disease, and the loss which the State suffers in consequence, the question of sanitary reform will possess a new interest when viewed from an economic standpoint. Nothing comes closer home to every citizen than the taxes he is obliged to pay, and an increase or decrease in the amount he is to be assessed is matter of considerable moment to him.

It is difficult to estimate correctly the value of a human life, or to compute the loss to the State caused by the disability of a portion of those who contribute to its wealth. But we are able to know approximately. From a valuable paper, prepared and read by Dr. J. H. Kellogg before the State Board of Health, at a recent meeting, I have borrowed a few figures, which show the annual loss to the State of Michigan caused by diseases which are believed to be preventable by such means as can readily be commanded by the proper authorities.

Two and three-fourths per cent of the paupers supported by the State, two per cent of the pauper insane, thirty-three per cent of the deaf and dumb, and seven per cent of the blind are made so through preventable disease,—making a total of 3,564 persons who are a burden on society by reason of unnecessary and preventable sickness. The annual expense of caring for this number is $29,225. The amount invested in buildings for the care of this portion of our dependent population is $192,000. The annual interest on which, added to the sum already given, makes the cost of maintaining them, $40,000. This, however, is but a small portion of the loss to the State. There were 4,585 deaths in the year 1880 from preventable causes. Estimating each life at $1,000, we have a loss of $4,585,000. But for every person who dies there are two who are sick. This would give 9,000 sick. The expense of each sick person per year is not less than $200.00. This would give an annual expense for care of the sick, $1,800,000. Add the cost to the State in loss of life, $4,585,000, and the cost of maintaining the pauper class, the deaf and dumb and blind, $40,000. We then have $6,425,000 as the approximate total annual cost to the State from preventable disease. These figures might be increased by adding the value of the services of those who are withdrawn from active work by reason of disability caused by preventable disease. Very much of this enormous loss might be saved to the State by the more universal adoption of sanitary measures. The State can well afford to pay ten times what it now pays for public health service, if thereby even one-half of the annual loss from preventable sickness could be saved. What is needed to accomplish this is the more general education of all classes in sanitary matters, in order that all persons may apply to their own daily lives those necessary regulations which will insure the most perfect condition of public health.

Justice Thomas M. Cooley, LL. D., president of the convention, then gave his address, which was as follows:—

PRESIDENT'S ADDRESS.

WHAT CAN THE LAW DO FOR THE HEALTH OF THE PEOPLE?

BY THOMAS M. COOLEY, LL. D.

Sanitary science has vital interest for every member of the community. In a measure we commit the care of our health to a profession who make the science their study, but to a much larger extent our health is and must be our own care. If we would preserve it, we must know something of the laws which affect the health, and we must take care to obey them. No physician can shield us against the consequences of our own imprudence: he may perhaps mitigate the evils and save us from fatal results; but the penalties of a disregard of nature's laws can never be wholly escaped. Our personal comfort and safety therefore demand perpetual vigilance to guard against disease, and for the most part every man must be his own protector.

In some directions, however, health is exposed from causes which render the interposition of the State essential, because individual care and precaution would be inadequate to full protection. This is often the case when diseases prevail over a large field, so that organized action is necessary to interpose obstacles, and perhaps even the employment of force to suppress dangerous practices or to stop the movements of commerce when contagion accompanies it. Sometimes also individual imprudence threatens more than individual injury. So that for various reasons the question often presents itself, *What can the law do for the health of the people?* It is to that question I shall briefly direct your attention now.

To many persons probably the question I have stated will appear at first of theoretical rather than of practical importance, for until one has given the matter some thought, he is very likely to have an impression that the sphere of law in the domain of sanitary science is very narrow and very unimportant. In truth, however, the control of the law in some directions is very extensive and very imperative; and if it is not also beneficial, the State must be exercising extraordinary powers without any adequate justification. The case of quarantine laws may be taken as an illustration. Every country in the civilized world adopts and enforces such laws; and some evidence of salutary results to justify them is found in the fact that the tendency to strengthen and extend them increases as nations increase in civilization, humanity, and general intelligence. But the evidence of the benefit of these laws is not wholly inferential; there are some very positive and very striking proofs. Among these we might instance the entire cessation of those frightful and devastating calamities which under the name of plagues or sometimes of black-death were frequent in Europe until within the last two hundred years.

It was formerly supposed when such a calamity swept over the land, that the Supreme Being was angry for the sins of the people, and that the disease was a special visitation of an offended Providence. The source of the affliction being thus determined, the remedy was sought in prayers and votive offerings; and when the disease had run its course these were supposed to have availed. But from time to time enlightened physicians who were in advance of a superstitious age, began to investigate in a scientific spirit the causes of the disease, and had no difficulty in discovering those which were abundant in the viola-

tion of the most simple and most imperative laws of health. The path of the pestilence was generally traced backward without difficulty to the low and marshy grounds in the region of the Mediterranean and Black Seas, where in a hot and miasmatic atmosphere the people live in low and crowded or badly ventilated abodes, allowing vegetable and animal matter to accumulate about their dwellings, drinking from wells or fountains into which the water filters through the accumulated filth of ages, and prepared by their scanty and precarious fare to fall victims to the diseases which their vices and their disregard of sanitary laws are certain to breed. From Egypt, Tripoli, and Turkey the pestilence followed in the track of commerce or of war over the continent of Europe; in every city it found the conditions ripe for its reception; for vice was everywhere, and filth and houses stifling with pestilential breath; and so from land to land the pestilence moved on in its desolating course. In 1665 London was almost depopulated by the disease and by the terror it created, and Moscow and some other cities in eastern and southern Europe were devastated by it still later.

Another scourge equally fearful has been the Asiatic cholera. The source of this disease was long a mystery, but it has been very satisfactorily traced in modern times, and the causes are found to be not only abundant, but readily understood and appreciated. The immediate occasion for a thorough investigation was the appearance of the disease in its most malignant and destructive form in an English army in India in the year 1781. This was shortly after one of the great periodical festivals near the temple of Juggernaut, and the army had encamped upon the ground which the pilgrims had recently occupied, and had drank from their wells. The ground was of course reeking with filth; the water was of course deadly with poison. Discovering a sufficient immediate cause for the visit of the disease on that occasion, the physicians pushed their inquiries further, and had no difficulty in satisfying themselves that every recurring festival of the sort originated the same disease, and that when the pilgrims departed for their homes the cholera started with them on its journey around the world.

The cholera which caused such havoc in this country fifty years ago originated at Hudwar, a place of pilgrimage at the source of the Ganges, where it is said not less than 3,000,000 people were accustomed to assemble every twelfth year. From there it was carried by the returning pilgrims until it encountered the caravans of commerce, and by them was spread slowly but surely over the whole of Asia and Europe. In the third year it reached Astrakan; in the fourth it made its appearance in the armies of Poland and Russia, and in the Russian seaports, whence it was carried in coal vessels to England; in the sixth year emigrant vessels conveyed it from the British Islands to Quebec and Detroit, and it soon spread over the western continent. Every step is easily traced, and at every step stringent police regulations enforced by adequate power might have arrested its progress.

The epidemic has ceased to be alarming, in part because with the extension of British rule and British ideas in India the great religious gatherings diminished in size and unwholesome nature; in part because the disease is better understood and handled, and in part because quarantine regulations are very strictly enforced against it. But that the occasions for vigilance are still abundant is evident from what has occurred during the last year. From time to time we heard through the public journals that cholera was prevailing among the pilgrims to Mecca, and that the mortality was so great among them as to convert their religious fervor into a panic. Competent men, believing

that a special cause must be discoverable, instituted an investigation, and easily found the cause in the holy well from whose waters all had drank. This well is never cleaned, and drinking from it is like drinking from the sewers of a great city. Nothing but the fanaticism of the most uncompromising ignorance could ever induce a human being to imbibe its poison.

If the plague has been checked and the cholera stripped of half its horrors, the same is true to a great extent of the yellow fever also. Formerly it visited all the Atlantic and gulf seaports of this country, and was sometimes destructive in them all; now the stringent regulations of quarantine give a protection against it which is very near complete. It made sad havoc in Memphis in the year 1878, but there were special reasons in the bad condition of the city; and some other towns suffered which long immunity from the scourge had made neglectful of precautions.

It is highly probable that new demands for quarantine laws will arise from time to time, growing out of new conditions, and that it will be necessary to bring within their scope beasts as well as persons; especially all those beasts which are made the food of man. One very urgent necessity has recently arisen in the case of cattle affected by pleuro-pneumonia. This disease which has caused such destruction among the cattle of the country, is found to be communicated by contact, and it seems highly probable that no sure method of checking it will be discovered except the unhesitating destruction of every beast that has been exposed, and a rigid prohibition of any export of cattle from districts where the disease has prevailed, until it is certain that the danger of contagion is altogether past.

It is not likely that any participant in our deliberations will question the propriety of quarantine regulations, or their importance in impeding the spread of diseases like those that have been mentioned. There is an impression with many, however, that it is only when large districts of country are in question that the government may rightfully interfere, and that the sanitary affairs of neighborhoods and households must be left to those whom they immediately concern. There is an instinctive and traditionary prejudice among people of Anglo-Saxon descent against the interference of the government in their neighborhood and domestic interests; and one reason why they implicitly accept their existing government as the best in the world is because that of all governments the people feel its presence the least. Domestic sanitary regulations seem to many like domestic sumptuary regulations, which can justly and rightfully emanate only from those whom they concern, and must constitute a part of their rightful pursuit of happiness in their own way.

It must be conceded, however, that the power of the government to establish local and domestic sanitary regulations is just as complete and perfect as its power to enact quarantine laws. Both classes of regulations have the same general object in view, and are supported by the same reasons. If a man who has been exposed to yellow fever, or who comes from an infected port, may be refused landing at New York lest he carry contagion into the city, the children attending the public schools may be refused admission until they submit to vaccination as a protection against contracting and imparting to others a disease as deadly as the yellow fever and quite as unmanageable. It is the same power that is exerted in both cases; we are familiar with its exercise in the one case and not in the other, and from thence come the different impressions respecting it.

In all directions the limit of individual liberty is reached when the action of the individual threatens injury to others or prejudice to the State. Individual

rights rest upon reasons which conduce to the general welfare, and no man can claim a right as against the State to make his premises the breeding-ground of disease. No man when he is in condition to contract and communicate a contagious disorder against which it would be practicable to provide, has any privilege to move about among his fellows without first taking the precautions which would afford protection. The principle that every man shall be at liberty to manage his business and personal concerns in his own way is of priceless value, but the exceptions to it are as undoubted as the principle is clear. Even a man's beast is found to be within the protection of the law if he undertakes to treat him with cruelty, and there is no business that the State may not supervise with a view to the general good. A short time since the world was startled and shocked by the great calamity in Vienna, where hundreds of people became the victims of a fire in one of its places of amusement. What advocate for individual liberty will be bold enough to deny to the State the power to require that every manager of a place of public amusement shall submit his premises to proper inspection, and shall observe such precautions as the public authorities may find needful to protect against similar calamities? A few years ago many persons in the State of Michigan were disposed to complain because they were required by the State law to take from their hinges the doors of the churches and public halls, and to make them open outward instead of inward as they formerly did. It seemed a useless regulation; but a single calamity like that which recently occurred in Illinois, in which, under the frenzy of a panic in a church a considerable number of women and children were trampled to death, is amply sufficient to justify the wisdom of the Michigan law. But the right of State intervention is by no means limited to the case of buildings of this semi-public character. If one proposes to erect a tenement building the State may with abundant reason insist on inspecting his plan, to make sure that it contemplates the necessary strength, security, and means of escape in case of fire, so that tenants shall not, under the name of a dwelling, be invited into a man-trap.

The complaints of State intervention in sanitary matters are likely to range themselves under the following heads:

1. That they needlessly and oppressively invade the domain of individual liberty.

2. That the regulations are likely to be committed for enforcement to unintelligent persons who are mere place-holders, and who care only to make their posts profitable.

3. That the confiding of sanitary matters to public officers who habitually neglect or ignorantly perform their duties, tends at the same time to relax the vigilance of individuals, so that the general result is that an expensive sanitary service is on the whole productive of little or no benefit.

To some extent, perhaps, we may all sympathize in these complaints. It is true that the sanitary service in all our cities is imperfect, and that its agents are often arbitrary in their dealings with individual rights. But it is a trite saying that the abuse of a power is no argument against its existence. No government service, unfortunately, is perfect; no society is managed with absolute justice and equity; no church in its ministrations is absolutely pure. Everything human must be taken with something of human imperfection; and this is especially true of sanitary laws and sanitary administration, for these deal with matters in respect to which there is still great ignorance among the people in general, and we must confess also no little bigotry among those who claim to be experts.

That sanitary science can only be imperfectly understood by the most of us we must concede. The causes of disease are numerous and occult, and to trace them is the sufficient study of a lifetime for able and thoughtful men. One who would understand them needs to be broad in his culture, careful in his investigations, of a judicial habit of mind, and uncontrolled by prejudice. If he thinks he has mastered his subject, he is likely to be occasionally surprised by the appearance of diseases which are not to be accounted for on any accepted theory, and it will then become necessary that he review and revise his conclusions, or that he look about him for new and unexpected conditions of things.

When sanitary regulations are established we have a right to assume that they represent the most enlightened thought in the community on the subject at the time. This will not always be true; but this will be the aim of those who establish them, and the instances will probably be very rare in which the regulations established by the public authorities are not better than none at all. It will besides be the business of the sanitary force to give more attention to the causes of disease and the methods of obviating them than can be given by persons absorbed in private business; and the performance of this duty will enable them to gather a great store of valuable facts from which we all may profit.

It is often said by physicians and by others that the diseases of their part of the country have greatly changed within a generation, and that new types have made their appearance. When that is the case we ought to be able to learn the causes. There is nothing capricious in nature, and every change must have its sufficient reason. It was formerly supposed that intermittent fevers were peculiar to certain districts; to low, marshy lands, or to countries where much new soil was being exposed to the sun; but all at once we find New England shaking with the ague, and the disease assumes a peculiarly obstinate and unyielding type. What does this mean? Hilly and sterile New England ought to be eminently secure against such invasions; and so it has seemed to be in the past. It may be very safely affirmed that no such disease springs up among the people unless new conditions supply the occasion. In unchanging New England new conditions are not much looked for, but they come as they do elsewhere, and perhaps when least expected. If New England physicians, some of whom now affirm that the causes of ague are little known, and are unwilling to concede that there are local causes in their section, would take occasion to study the disease in the neighborhood of the mill-dams of the west, they might perhaps come to know that it is impossible alternately to flood by mill-dams and then expose to the sun considerable tracts of land without producing the miasma on which the ague feeds. If New England gathers great numbers of persons into tenant houses, works them in crowded manufactories, from which they emerge at night into an atmosphere loaded with the exhalations of mill-ponds, New England must pay the penalty which those conditions demand. There is many a mill-dam in the country whose annual cost to the immediate neighborhood, in medicine, physicians' bills, and loss of effective time and energy for labor, is far beyond its whole worth; so that it may be said to be maintained at the expense of the people, to blight their health and destroy their powers. A feeling of the sacredness of vested rights in property saves many of these from destruction which ought long since to have been torn away; and the time will doubtless come when we shall wonder that we endured their evils so long and so patiently.

Many of the most serious causes of disease are now to be looked for where

formerly they were not to be found, and where many people will not suspect their existence. Of this the most common instance is the most forcible. The spring or the well has been with mankind from the earliest ages the synonym and representative of purity and health; and the dearest associations of many of us have clustered about the old homestead where the old oaken bucket was the most cherished of insensate objects. The water filters into the well through the purifying soil, and if periodically we remove from the well whatever may have accidentally fallen in, we receive the draught from the bucket as a health-giving and health-preserving beverage, and thank a bountiful Providence for giving it in abundant supply. But if the water trickles pure into the well it must be because the earth receives and retains whatever in it is impure, and it cannot do this forever without becoming saturated to a point at which, instead of retaining impurities, it will permit the water to carry off those already in it. No periodical cleaning out of the well into which the water then filters will save the water from being poisonous. If a family for a quarter of a century has been accustomed to cast the slops of the kitchen into the back yard, within two or three rods of the well; if a privy vault without exterior drainage is within convenient distance, and the pig-pen, hen-house, and barn-yard as near to the house as it is customary to bring them—the physician, when typhoid fever or some kindred disease makes its appearance in the family, if he is sufficiently intelligent to look beyond the symptoms for the causes, ought to turn his first attention to the excavation from which the family receive the constant beverage, but which is so well calculated to be a cesspool for kitchen, privy, pig-pen, and stable. There is probably not a city or a village in the State which has not within it wells which, for the reason indicated, ought long since to have been condemned and filled up. Fevers sometimes go through a family, taking off one member after another, and the unsuspected water of a foul well is both the original cause of the disease, and the insuperable obstacle to a recovery.

Boards of health have large powers in all these matters, and the danger is not so much that they will abuse their powers as that they will fail to exercise them. There ought to be very much more intelligent inspection of private grounds and buildings than there is. It is no doubt an invidious task for members of sanitary boards to assume to do this without invitation, and generally they should have it taken off their hands by the family physician if there is one. And I think a layman may well venture to express the opinion that physicians are not always sufficiently mindful of the duty to look beyond the disorder for the causes, and that in many cases they prescribe pills and powders for diseases which they find obstinate, when if they would carefully inspect the surrounding conditions they would find continuing causes which pills and powders cannot reach, but which ordinary care and attention to sanitary laws would easily and perfectly remove.

Some causes of disease are especially mischievous because they not only infect the body but the mind and morals also. With some of these the sanitary officers can do but little; they come more properly under the jurisdiction of those to whom is committed the administration of criminal law. It is greatly to be regretted that it is not as easy to organize and excite public sentiment against the evils of prostitution at our very doors, as it is against the kindred evil of polygamy in Utah, for a little vigorous effort in the suppression of the one would add greatly to our moral force and confidence when we move against the other. Sanitary boards ought to be more active than they are in this regard, both in inciting the officers of the law to the perform-

ance of their duties, and in seconding their efforts when they do act. A slaughter-house in a populated neighborhood is often mischievous beyond the direct effect upon health, in the brutalizing influence upon children and others who witness its spectacles or hear its noises. I commend this subject especially to your notice.

One of the most urgent needs of the day is a better understanding of the subject of ventilation. We all breathe poisoned air more or less; some of us in our own homes day and night; some of us in social visits with our neighbors, and nearly all of us when we congregate in public halls, court-houses, and other public buildings. The extent of this poisoning is incredible to every man who has not fully investigated it. A few years since the officer in charge of the Senate rooms at Washington made the startling statement that when the Senate room was crowded on occasions of great debates, the air that passed off through the foul air-duct was so poisonous that a rat could not live in it. His accuracy was questioned, but actual experiment proved the statement true. A trap with a rat in it was shut into the foul air flue on an occasion when the Senate chamber was crowded, and in a few minutes he was dead. In the room from which this flue drew off the poison the people were kept alive by the constant introduction of fresh air; but hundreds of public buildings have no adequate provision for conveying away the bad air, and some of them none at all. It will not be difficult, it is believed, to find public buildings where the ventilating flues seem to be ingeniously constructed to gather the foul air inside and retain it, instead of permitting it to pass away. Many of our builders are totally ignorant of all that pertains to ventilation, and they construct dwellings for us as though the main purpose was to exclude the fresh breath of heaven and let in the foul gases of badly constructed sewers and unsuitable water-closets. And people live in such dwellings, and wonder why it is that they suffer so from headaches, and are so subject to fevers and general debility.

The sphere of sanitary inspection and regulation is likely to be much greater hereafter than has been occupied hitherto, not only because the occasions for interference will be more numerous, but because our greater understanding of sanitary needs will make the necessity more obvious. The time will probably come when we shall adopt to some extent new views respecting individual rights, and when the State will deny to the individual that absolute control over himself to his own prejudice which he is now permitted to exercise. There is no law at the present time to prevent a man destroying his own life by vicious habits if he will only limit his indulgence to his own premises and not disturb the public with them; and it was only the other day that a young woman starved herself to death deliberately and without the interference of others, though her purpose was publicly announced and the progress of the starvation was published from day to day in the public journals. It is monstrous to say that the individual can have as against the State any absolute right thus to dispose of his own life; and it is well worthy of consideration whether there ought not to be criminal laws that would reach such cases, and also the cases of those who have become the slaves of vicious habits to an extent that destroys their capacity to care for themselves and makes them miserable dependents upon others or upon the public. A man who surrenders himself to indulgence with alcohol or opium to an extent that destroys his manhood, has no claim upon the State to be treated otherwise than as a criminal. We waste upon such persons too much of that sort of compassion which leads them to commiserate themselves as poor unfortunates, and thereby

encourages them in their vices; and when we punish them, it is likely to be with petty fines which make them more dependent, or by imprisonment in idleness in which there is no tendency to reformation. A more vigorous treatment which should compel such persons to perform service for the State which they refuse voluntarily to perform on their own behalf, would be more sensible, and far more likely to be efficient in reformation.

When the extent to which the State shall interfere with the action of individuals for sanitary protection is in question, we must of course keep in view the traditions and prejudices of our people, which are all in the direction of restraining the government within the narrowest bounds which are consistent with public welfare and safety. But the question what the limit shall be, is one of policy rather than of law. The judicial decisions recognize the most ample power in the State to do what seems best in sanitary matters. In Louisiana the State went so far for the protection of New Orleans against the customary evils of slaughter-houses, as to give to a company of individuals a monopoly of the slaughter of cattle for the market; an exercise of power that at first blush is startling; but it has been fully sustained by State and federal authorities.

Does the State introduce no evils in its well intended effort to preserve the health of the people? If it did not, it would be very surprising; for there is probably no other exercise of governmental authority that is not liable to cause evils and hardships. The best the State can ever do is to consult and endeavor to advance the general good; but individual hardships are inevitable. Those persons who with so much warmth and vehemence protest against vaccination as productive of more evil than good, can easily point to individual cases in which serious results have followed. It is equally easy to show that anesthetics destroy life, and to base an argument thereon that their use should be prohibited. It is possible to encounter peculiar conditions in any human system, which will give to any particular medical treatment or any medicine a peculiar effect; but we cannot for any such reason forbid the practice of medicine or the giving of remedies that generally prove beneficial. Nor can we, when the public safety is involved, consent that a man's protest shall exempt him from a sanitary regulation, merely because it is possible, though utterly improbable, that in his case the regulation may prove harmful. All progress in society, all amelioration in the condition of the people would be brought to a stand if such considerations could be suffered to control. We should condemn railroads and any other possible improvements, if we judged them solely upon the evils which they bring.

There is one very effectual protection against any considerable abuse of sanitary powers, which is this: That sanitary officers are not final judges when individual rights are involved. A board of health may order the destruction of a mill-dam as a nuisance; but if the owner denies the fact he is entitled to a trial of it before a jury of his fellows. If the board were to destroy it by their own authority, they would do so at the risk of being held accountable if the public sentiment as expressed in the verdict of a jury, did not conform to their own conclusion. This is abundant protection against arbitrary action by these boards; for though there is always a presumption in favor of their orders when they are made upon subjects within their jurisdiction, the presumption is not conclusive, and the leanings of a jury are likely to be against whatever to them has an appearance of being arbitrary or oppressive. And this consideration should never be lost sight of when sanitary affairs are under discussion. The people need to be educated in the laws of health and the causes of disease,

not only on their own account as individuals, but because they may at any time be summoned to assist in the administration of sanitary laws under circumstances when ignorance might be seriously detrimental. We have a right to be proud as citizens of Michigan, that our State has done and is doing so much in this direction. Having myself never been officially connected with sanitary work, I have nevertheless had some occasion to observe the labors of the State Board of Health, and to know that it was performing a service of great value to the State. Conventions like this are schools for us all; they alone will not make us wise in the subjects discussed, but we shall at least have our attention awakened and be more attentive hereafter to the dangers to health which are everywhere about us and threatening us.

One object I have had in opening the business of the convention with some reference to legal rules, is to impress the thought upon the members that sanitary boards are ministers of the law, clothed with high and responsible duties relating to some of the most important concerns of society. As such they are entitled to our cordial support and assistance, and we should give these freely and without reserve. The greatness of a State is to be found, not in its fields, and forests, and mines, and rivers, and lakes, but in the manner in which these are made available for the benefit of mankind through the physical and intellectual labors of a robust and vigorous people. And to have a robust and vigorous people, we must give encouragement and assistance to those whose duties, investigations, and labors make them our teachers in the laws of health, and our monitors when we fail to observe them.

The next paper was on "Hygiene of the Eye," by Prof. C. J. Lundy, M. D., of Detroit. It here follows:—

HYGIENE IN RELATION TO THE EYE.

BY PROF. C. J. LUNDY, M. D., OF DETROIT.

Mr. President, Ladies and Gentlemen:

Two years ago I had the honor to read a paper on "Light in the Public Schools," before the first sanitary convention held in this State. To-day it is again my privilege to address an audience convened in the interest of sanitary science, and I have chosen for my theme "Hygiene, in Relation to the Eye."

This subject has not received the attention to which it is fairly entitled, and I regret that it is not in my power to do it justice. I can only direct your attention to a few of the salient points of an important and interesting subject.

I need not call your attention to the delicacy with which the visual apparatus is constructed, nor to the sensitiveness of the retina, and the ease with which this delicate, sensitive membrane may be injured. Neither shall I direct your attention, in a particular manner, to the eye as being simply an organ of the special sense of sight; for, unlike some other organs of special sense, it is dependent, to a great extent, upon muscular action for the proper performance of its functions as a visual organ.

The eye is controlled in its movements by a muscular apparatus, which is subject to the same general laws as are other muscular structures. No motion of the eye to right or left, upward or downward, can be accomplished without bringing into play a portion of this muscular apparatus. No change in the focus of the eye, for distant or for near vision, can be made without muscular force. No near object can be seen accurately, for even one minute, by the

normal eye without sustained muscular effort. For distinct vision of near objects, the muscles of the normal eye must sustain tension with an evenness and a steadiness almost without parallel in other muscles. The slightest variation in the degree of this muscular tension causes a blurring of the retinal images, and consequently, indistinct vision. Is it surprising then, that over-use and abuse of the eyes lead to discomfort and disease?

It seems difficult for some persons to understand why the eyes may not be used indefinitely without fatigue. For ten, twelve, or more hours in every twenty-four, the eyes are expected to perform their functions, even under improper conditions, and are expected to do so without causing discomfort or annoyance. Not long since a high school pupil applied to me for advice. She spent nearly five hours a day at school, in badly lighted school rooms, and at home she was obliged to study five hours more. During winter, three hours of the study at home were done by artificial light. She complained that her eyes became tired and painful before her tasks were completed. When asked how long she could walk without becoming fatigued, she replied, "about one hour." Although the muscles of locomotion became fatigued by moderate exercise within an hour, yet she could not understand why use of the eye and eye muscles continuously for five hours, and under unnatural conditions, should have produced discomfort.

It is a fact well known to every oculist, that few eyes are perfect in shape, when considered as optical instruments. Many eyes are too short in their antero-posterior diameter, and this shortening gives rise to the refractive error known as hyperopia or far sight. Some eyes are too long in this diameter, and in such cases the eyes are said to be short-sighted or myopic. Other eyes lack symmetry of curvature in their refracting surfaces (cornea and crystalline lens), and in them rays of light are not focused at a single point, but at different points. In the normal, emmetropic eye, the eye whose shape, length and symmetry are perfect, parallel rays of light are accurately focused upon the retina when the eye is at rest. But even the emmetropic eye cannot be abused without evil consequences. If, then, the perfectly shaped eyes suffer from over-use and abuse, it can be readily understood that eyes which lack this perfection of shape may be easily injured. From over-use of the eyes, especially where abnormality exists, we see a variety of troubles arising. Exhaustion of muscular and nervous energy, pain in and about the eye-ball, browache, headache, and even dizziness and nausea, are some of the many discomforts which may be observed in such cases. Inflammation of the edges of the lids, falling out of the lashes (and I have seen many an otherwise beautiful face disfigured by an almost entire absence of the eye-lashes), conjunctivitis, deformities of the lids, retinal congestion and irritation, and myopia are some of the evil results of over-use and abuse of the eyes.

I have seen patients who took physic for months, and even years, for headaches, arising from over-use of their imperfectly shaped eyes; and verily it were better to have thrown physic to the dogs, for when the errors of refraction were corrected and the patients were warned about the use and the abuse of their eyes, the headaches and the so-called bilious attacks became things of the past.

We do not expect the dwarf, or the weakling, or the cripple to do the work of a full-grown, robust, healthy man or woman, and yet we grumble because the eyes, few of which are perfect, are unable to stand abuse or an unreasonable amount of use.

We see men and women reading newspapers and badly printed books for sev-

eral hours at a time while riding in railroad cars. We see young people, and old people too, who habitually sit in the dim twilight poring over some cheaply printed novel or continued story paper. We see people reading for hours by a flickering gas-light, which is probably six or eight feet distant from their book or paper. We know of people who read for long periods at a time while lying down, often too, when that time should be devoted to sleep. We have seen (at least I have) pupils compelled to study in school-rooms so poorly lighted that it was necessary to burn gas except on bright days. We have seen all these things and many more, and we, who know that nature's laws have been transgressed, do not wonder at the results.

Poor light, both in quantity and quality, is a prolific source of eye troubles. If the light is insufficient, the book or paper will be brought nearer to the eyes than if the light were good. The light reflected from any given surface varies inversely to the square of the distance of the object. Thus, if a book be held eight inches from the eye (a point that is entirely too near) it will reflect more than twice as much light to the eye as if it were held twelve inches away. As the retinal images are not distinct when the light is poor, it is but natural that people should try to overcome this disadvantage. This is usually done by bending the head forward, and bringing the face close to the book or paper. The result is, that normal and hyperopic eyes are strained, and become irritated, congested, and painful by such usage; and in many cases, myopia, or near-sight, occurs if this abuse is persisted in. To the myopic eye this is still more injurious, for such practice causes increase of the myopia. The myopia occasionally reaches an alarming degree, and in addition to the discomfort and annoyance to which highly myopic persons are subjected, a certain number of them are in danger of total blindness from disorganization of the eye. That bad and insufficient light and over-study are the most potent direct causes of myopia there can be little doubt. In a paper read at the sanitary convention in Detroit two years ago, I furnished abundance of statistical and other proofs of the correctness of this statement.

Where sun-light and fresh air are not to be had without money and without price, one might account for the meagreness with which these gifts of nature are admitted to some of our public institutions. Natural light is the most desirable, the most agreeable, and the most healthful. It should be abundant without producing glare; it should come from the proper direction, and it should be properly distributed to all parts of the room. In many of the school-rooms which I have examined, the pupils who sat near the windows enjoyed the advantage of abundant light, while to others remote from the windows, the amount of light furnished was less than one-third what it should have been. It has been generally conceded by those who have given most attention to, and who are most competent to express opinions upon the subject, that the window space in school-rooms should be equal to 30 to 50 per cent of the floor surface. Any one who has taken the trouble to investigate this subject for himself will be convinced that a proportion of window surface less than one-fourth the floor surface will not light a school-room properly. In the schools of Detroit I have examined rooms in which the window surface was scarcely equal to five per cent of the floor surface. I have seen gas-lighting at mid-day in the Detroit high school in order that pupils might see to read, and yet it is maintained that these rooms are well lighted. Where this outrageous condition of affairs exists, the lintels of the windows are fully five feet below the ceiling of the room.

This building has furnished me numerous patients, and it will continue to do so until this unfortunate condition of affairs is corrected. I have been told by more than one patient that the wretched light in a certain room in the school referred to was the cause of their myopia.

For study and reading at home during the long winter evenings, it becomes necessary to use artifical light. Great care should be taken to have good and abundant light for this purpose. In many instances the lamp stands in front of the reader or pupil, and in such a way that the light is reflected directly into the eye. It should be borne in mind that the angle of reflection is equal to the angle of incidence. Therefore, the book should bear such a relation to the lamp and to the face, that the angle of incidence shall differ from the angle formed by the book and the eye.

The lamp should be placed to the left of the reader, slightly in front, and at sufficient distance to avoid any discomfort from the heat of the flame. The flame should be steady and uniform in character, for flickering of the flame and sudden variations in the amount and intensity of the light prove irritating to the eye.

As a means of illumination, the electric light is being rapidly introduced into our large towns and cities, and it remains to be seen whether this new applicant for public favor will supplant other artificial illuminators. I have only observed the light used in Detroit, and therefore should not condemn all electric lights. Besides, with more perfect instruments and apparatus, it is possible that we may eventually get a better light. But the light which I have observed will prove injurious to the eyes, unless it is improved in many respects. It is true, the electric light does not differ greatly from sun light, but the glare of sun light may irritate the retina. The electric light is liable to injure the retina by over stimulation which leads to exhaustion, just as over stimulation leads to exhaustion of power in other parts of the human economy.

But the unsteadiness of the light and the sudden and marked variations in its intensity are probably the worst features about this kind of illumination. When the light is dim the pupil dilates, and when the light suddenly shines forth again with all the brilliancy of the noon-day sun, the pupil momentarily admits a large amount of light, and this necessarily proves a source of retinal irritation. The electric light which I have observed is entirely unsuited for any but large, spacious buildings or for street lighting. Introduced into an ordinary sized room, and especially if the walls were white or glazed, it would prove as irritating to the retina as would the direct rays of the sun.

In public schools, properly constructed and arranged, seats and desks are of much importance. The height of the seat should bear a correct relation to the height of the desk, and both should be arranged to suit the size of the pupil. If the desk is too high, the pupil's shoulders will be unnaturally elevated if he attempt to rest the forearm or elbow upon the desk. Neither should the desk be so low, that the pupil is obliged to bend over in order to come within range of his book or paper. It should be borne in mind that the stooping position causes congestion of the head, face, and eyes, by preventing the free return of blood from these parts. It should also be borne in mind that frequently repeated and long continued congestion of the eyeball acts indirectly as a cause of myopia.

An abuse which is ever crying out for correction is the misplacement of blackboards in our public schools. To the best of my recollection, I have not

examined a single school room in which blackboards were not placed between windows. Light coming from the front irritates the eye, even if the eye is not turned directly toward the light. Furthermore, blackboards so placed cannot be well lighted, and, besides, they absorb much of the light which falls upon them.

Alcoholic liquors and tobacco have occasionally shown their evil effects upon the eye, as well as upon other parts of the human economy. Although the optic nerve is the part which usually suffers especial injury, yet other portions of the eye do not escape unharmed. Only a few weeks since I saw a young man, a member of an old and wealthy family, a man who might have been an honor to his name and to his race, and an ornament to society, had he not yielded to the temptations of the flowing bowl. The twin vices, dram-drinking and the use of tobacco, had enslaved him, and had made of him not only a physical wreck—a mere shadow of his former greatness—but they had also destroyed for him all useful vision. His optic nerves were wasted and atrophied, and were no longer capable of conveying visual impressions to his befuddled brain.

It may now be asked what can be done to correct the abuses to which I have referred, and for which remedies have not already been suggested? In reply, it may be said that it is fairly within our power to correct most if not all of these abuses. By proper care, it is also within our power to limit, or entirely prevent, the ill effects which the pursuit of study might otherwise exert upon the visual organs. It is to be hoped that school officers and others having the care of our children will, at no distant day, take steps to relieve our boasted modern education of its disadvantages, and of its injurious influences upon the eye. Steps should also be taken to better instruct those who are no longer pupils, in the ordinary acceptation of the term, how to take proper care of their eyes, and also to impress upon them the fact that abuse will be almost surely followed by a day of retribution.

Errors of refraction, arising from defects in the conformation of the eye, should be corrected by suitable glasses. The myopic individual, particularly, should be carefully fitted with proper spectacles, and if he be a student or pupil, he should be warned of the danger-land which he is liable to enter. I must repeat with emphasis what I said two years since in regard to the danger of permitting so-called opticians to fit spectacles for near-sighted persons. Not long since a lady applied to me for advice concerning a trouble of her eyes. She was highly myopic, and a self-styled optician had given her spectacles which had done her great injury. For distance a "concave five" neutralized her myopia and enabled her to accurately focus parallel rays of light upon her retina, while for reading and near work she required a much weaker glass. To my astonishment I found that the optician had given her a "concave four" for a reading glass. The results were, pain in, and congestion of, the eyeball, diminished acuteness of vision, and the lighting up of an inflammation at the back of the eye (sclerotico-choriditis posterior), which might have ended in detachment of the retina and total blindness. People who have astigmatism from lack of symmetry in the curvature of the refracting surfaces, as well as far-sighted individuals, should also have their optical defects corrected. I recently saw a young lady, a pupil in the Detroit high school, whose hyperopia or far-sightedness was equal to one-seventh, that is, it required a convex glass, whose focal power was seven inches, to enable her to bring parallel rays of light to a focus upon the retina when the eye was at rest. It is evident that it required an enormous strain upon the ciliary

muscle and upon the interni to enable her to focus divergent rays upon her retina. Of course the eyes were painful, congested and inflamed as the result of this excessive strain, but when she was properly fitted with spectacles, her eye troubles were at once relieved, and she is now pursuing her studies with comparative comfort. Even if this young woman were placed in the most favorable hygienic conditions, she would still have suffered, had not her error of refraction been corrected.

It is very important that books shall be well printed. Many—indeed most of our text books are faulty in regard to the size and style of type. The type should be large, with a clearly cut, full face, and the ink should be of a superior quality, for even with good type, good work cannot be done if the ink is poor. The English text books are superior to our own in many respects, and this fact was clearly demonstrated at the centennial exposition. Indeed, all the better classes of English publications are printed in better type and with better ink than are similar publications in this country.

It is important that the hygienic conditions should be good, for bad hygienic surroundings weaken the muscular system and predispose to eye troubles. A vitiated, bad atmosphere, such as I have often encountered when examining school-rooms, not only dulls the intellect and retards mental and physical development, but it also exercises, both directly and indirectly, an injurious influence upon the eye. The means of ventilation in most schools and in many dwellings are entirely inadequate. So far as the schools are concerned, the teachers attempt to remedy the defect by opening the windows. The result is not a happy one, for pupils seated near the windows are chilled by the draft of cold air which is thus allowed to blow upon them, and in consequence we see numerous cases of catarrhal inflammation of the eye, ear, throat, and nose.

Reading and study should be done systematically, and this rule applies to old people as well as to the young. As already stated, the eyes are subject to the same natural laws that govern other portions of the human economy, and they can be used with least discomfort when that use is systematic. I have seen people who gave up all attempts at reading and study on account of the discomfort they produced. After learning to use the eyes systematically, daily increasing the task by one or two minutes, these same people could finally read one or two hours at a time without discomfort or fatigue. In most cases daily systematic out-door exercise was also directed.

The name of the late Dr. Winship and his wonderful physical development, are familiar to almost everyone. His remarkable muscular power was the result of careful systematic training. The strength of the eye muscles can be developed in much the same way by systematic training combined with general physical culture. Too much cannot be said of the importance of physical culture, especially during school and college life. Asthenopia (weakness of the eyes) prevails to a much greater extent among students than among other classes. Prof. C. R. Agnew, of New York, in analyzing the causes of asthenopia in 362 male patients, found that 154, or nearly one-half, were students. In Germany comparatively little attention is given to out-door sports and gymnastic exercises, and in that country, of all others, myopia prevails to an alarming extent. And it should not be forgotten that myopia means weakness and disease. In England, on the other hand, out-door sports are freely indulged in, and although their scholarship is of the highest order, yet myopia is not nearly so prevalent. I am glad to know that an effort is being made to establish a gymnasium in connection with our State University. Even if our State Legislature does not make an appropriation for this purpose, as it should do, yet I

hope our public spirited citizens will not allow the project to fail. To the University we must look for the men who will become the educators of our children, and these men should be trained physically as well as mentally, that they may know how to train those committed to their care.

In conclusion, I shall add that the following may be laid down as a few of the rules for our guidance in the care of our eyes:

1. Avoid reading and study by poor light.
2. Light should come from the side, and not from the back or from the front.
3. Do not read or study while suffering great bodily fatigue or during recovery from illness.
4. Do not read while lying down.
5. Do not use the eyes too long at a time for near work, but give them occasional periods of rest.
6. Reading and study should be done systematically.
7. During study avoid the stooping position, or whatever tends to produce congestion of the head and face.
8. Select well printed books.
9. Correct errors of refraction with proper glasses.
10. Avoid bad hygienic conditions and the use of alcohol and tobacco.
11. Take sufficient exercise in the open air.
12. Let the physical keep pace with the mental culture, for asthenopia is most usually observed in those who are lacking in physical development.

This paper was discussed by Dr. Frothingham and others.

In the absence of Dr. Kinne, who was to read the next paper on the program, a voluntary paper by Prof. A. B. Palmer, M. D., was substituted. It has not been received for publication.

The convention then adjourned until 7:30 P. M.

SECOND SESSION, TUESDAY EVENING, FEBRUARY 28, AT 7:30.

The convention was called to order, and the first paper was read by Rev. T. P. Prudden, as follows:—

THE CARE OF HEALTH A CHRISTIAN DUTY.

BY REV. T. P. PRUDDEN, OF LANSING, MICHIGAN.

When we read of men who years ago hoped to gain special honor in Heaven, or the reputation of sanctity on earth, by abusing or neglecting their bodies, it seems both wrong and absurd. But when people nowadays unnecessarily sacrifice their health, by reason of ignorance, neglect, or abuse, though it be less absurd, is it any less wrong? In England, however, it is said that there are annually over one hundred thousand preventable deaths, and over one million cases of preventable sickness. Probably there are no fewer in our own land.

The human body has indeed sometimes been spoken of, or sung about, as "a lump of clay," "a vile thing of flesh and blood," or a hindrance, of which the less one thought the better. Not seldom has it been regarded as a possession which might be misused without immorality—even if it were not a morality to misuse it. It is doubtful if even *our* ideal of a holy man would not be one with stooping shoulders, an unnatural paleness, a poor appetite, and an appearance of not being long for this world, rather than one broad-backed, muscular, full of vitality. An intimate relation between spirituality and a vigorous physical life is assumed to be impossible. The preserving of health

seems to me, however, not merely a plain duty, but a duty which Christianity especially sanctions and enforces. Paul expressly teaches that a man may sin against his own body as truly as he may sin against God. He may also glorify God in his body.

If I speak of each person's care for his own health rather than for the health of the public, it is because I remember that the sanitary kingdom, like the kingdom of Heaven, cometh not with observation, but must be within men individually, and thence leaven the whole lump. Important as is the defense of a community against threatening disease, the strengthening and repairing the body, and the keeping extra resources for an as-yet-unseen emergency, on the part of each one, are no less important.

It can hardly be said that care for one's own health is as direct a command of Christ as love and forgiveness are, yet it is made hardly less clear. Undoubtedly the remarkable freedom of the Jews from contagious and hereditary diseases, and their great vitality, are due to the religious sanctity with which sanitary laws were enforced. It was a reproach not to possess good health. It was a religious duty to preserve it. Whatever mistakes of Moses are found elsewhere, there was no mistake in his legislation in this respect.

Our Savior is indeed a spiritual teacher and deliverer, but He is also preëminently a restorer from bodily ills. Out of 36 recorded miracles, 23 were of healing, and 28 were to satisfy physical needs. If miracles are signs of His power who worked them, they are also a sign of how He looked on men and that he would relieve them from disease as well as from sin. Against every enemy of mankind He wages His war of deliverance. He early announces His mission, as not only to "preach the good tidings to the poor," and "release to the captives," but also "recovery of sight to the blind, and to set at liberty those that are bruised." The hunger of the multitude stirred his compassion. He listened to the cries of bodily as well as spiritual ills. Before announcing the gospel, He cured the sick and blind and halt, and cast out devils, as if pain and disease had no place in His presence. When the 70 disciples were sent out, it was with the direct injunction to first heal the sick in every city, and then proclaim the kingdom of Heaven, as if these two together constituted the gospel. When in later times the Apostle Peter describes our Lord to Cornelius of the Italian band, it is as one "annointed with the Holy Ghost with power, who went about doing good and healing all that were oppressed of the devil for God was with him." If Christ's *words* are silent about the body, His *deeds* give no uncertain utterance about what He thought it worth. If He spoke of the soul preëminently, His life did not warrant a care for the soul to the neglect of, nor at the expense of, the body.

And aside from this how clearly Christ teaches that every capacity or gift is to be developed to the utmost. He came not to destroy, but to fulfill. Each talent is to be used. From those to whom much is given much will be required. No Christian would question that whatever in us is spiritual, or mental, must be nurtured and developed. But by what authority shall we so estimate the gifts of God as to exempt our bodies? Applying Christ's lesson of the talents to our powers of thought and of influence, and even to the use of our opportunities and our money, are bodily powers any less valuable or any less really gifts? Can we without sin leave them hidden unimproved in a napkin? Much less, can we neglect them till their value is impaired? Least of all, can we abuse or throw them away?

Moreover, the views and exercises of even religion itself depend in a great measure on good health. Illness and weariness will cloud trust and hope.

With impaired vigor creep in doubts and anxieties. I have known many whose religious thoughts and experiences were a reflection of their state of health. Many a case of religious despondency has been cured by tonics, rest, and out-door life. I question if it is possible to rise to the real greatness of prayer, or an appreciation of God's gifts to us, while our bodies are unstrung, and the stream of life, which should be rushing, moves only sluggishly. Even our intellects are affected. "A sound mind in a sound body" is an old proverb. Religion embraces thoughts wider than the utmost sweep of our minds; its experiences play upon the most delicate of our sentiments, and its hopes and inspirations touch life at an hundred points. Thus bodily health has largely shaped human conceptions of truth, and colored the pictures of the imagination. Theology has been affected. No wonder that strange doctrines came from ascetics in their cells. No wonder that views of truth, seen through a head that ached, or a body that took no exercise, after a dinner that was not digested, or in the morning after a sleepless night, should have had their share of gloom and error. Dr. Holmes speaks of volumes of sermons in his library that should have been labeled dyspepsia. We may have heard some not yet bound, which might be similarly labeled.

Good health is also a necessity for successful religious work. If Christianity were simply a calm enjoyment of certain ideas, or a letting our thoughts rest in beatific contemplation on the glory of God, then ill health might not be so great an evil. But one who labors in the vineyard, trades with his talents, "sheds his good light on a naughty world," heals, comforts, gives, and gains that he may give, or who like the good Samaritan, would lift the traveler upon his own beast, and take him to an inn, and pay the bill, must have good health, or he fails.

It has, I confess, sometimes been the custom (especially in Sunday School literature), to point to a patient and suffering invalid, as revealing the fairest triumphs of christianity. There is no reason in it, save as showing what may be, even under circumstances the most unfavorable. Many a man has succeeded in spite of great hindrances. If we point to him as an example of what one may do under difficulties, we do not therefore regard the difficulties as special aids. One with an unsound body may attain great patience and resignation, and even beauty of character, but from great christian deeds he is excluded. Those who conquer must be fitted for endurance. They must be well armed, and able to do something more than be patient and resigned.

Our health also is, if not the first condition, at least one of the first conditions, of attaining every object in life to which an honest ambition may aspire. It makes the character of the ship in which we sail. If it is uncertain and leaky, or if we must stop to pump, or lie by for repairs, it is so much less useful. If it will not hold together for a long voyage, we are able to make only a short voyage. If it is liable to be wrecked in the first storm, or in an extra strain, the whole value of our learning, skill, power, the precious treasures of our cargoes, may be lost. Again and again the world has mourned over the wreck of richly freighted lives because the ship went to pieces in the midst of the voyage. Men saw it floundering and tried to save it, but worn out or neglected it sank before them. Health, smiling, young, beautiful, might almost be deified, as she was in Greece, she brings so much to men. As that weakens, all is threatened with disaster. Let that fail and every plan must be given up. When such men as Raphael, Burns, and F. W. Robertson die at 37, and Byron at 36, it seems as if they had only begun to do what they might have done, if they had suitably cared for their bodies. "Other mistakes,"

says Rev. T. T. Munger, "may be overcome,—mind and moral natures are subject to the will, but a weakened body, who can correct that? There are for it no repentances and forgivings, but only the stern order of the material world, reaping after the sowing. * * * * It is late before we learn that the whole of a man goes into his work. Poet or orator or philosopher or man of business, his body follows him, and holds the pen, and shapes the thought, and imparts its quality to all that he does or says. An impaired vitality of body implies an element of weakness, * * * and no heroism of spirit, or strength of will, or industry can eliminate it." Overwork may do the evil. It is more often done by late hours, bad or irregular habits of living, eating, or sleeping, by wasted efforts, or by whatever may use up vital energy, or breed disease. These consume the oil of life. The light burns more and more dimly, until in some crisis, "Behold the bridegroom cometh" is heard, and while we seek to replenish our exhausted stock, the lamp goes out. The public health requires not merely the directing of attention to cess-pools, drains, and contagious diseases, but to every less easily stopped, and no less fatal method of living and working, by which both the length and the vigor and accomplishments of life are cut off. Epidemics and pestilences, like vulgar crimes, cause consternation, and a determination to root them out, but the neglect and abuse of health, by which people are fitted to become the victims of epidemics and pestilences, like the more reputable sins from which great crimes grow, are too often overlooked.

As therefore, each one's own health is a capacity or endowment to be perfected and used aright; as it is one condition on which even correct religious ideas and experiences depend; and as it is a necessary means for doing not only christian work, but nearly every thing that a human being may aim or expect to do, the care and preservation of it becomes evidently a christian duty. A soldier who neglects his arms, or who treats them so that they will not work, is not blameless though he be ever so brave. Keeping his gun in good order and his ammunition dry, may be as sacred a duty as to face the foe.

No christian would justify suicide, but what is the difference morally, whether we take our lives quickly or slowly, by arsenic, or by breathing bad air, neglecting sleep and rest—or using our bodies so that death comes prematurely; by letting a wound bleed unchecked, or not observing precautions and laws by which life may be prolonged? If it is wrong to take one's own life, what difference does it make whether we use one kind of means or another? It is true that a suicide may deliberately intend to end his life, and a man that neglects or abuses his health may not. The latter, however certainly is lightly esteeming and unnecessarily jeopardizing what the former throws away.

The apostle Paul calls the human body "a temple of the Holy Ghost." A structure beautiful and grand enough to be the residence of the divine Spirit, and sacred therefore, as only an holy thing could be, surely is worthy of at least the care and reverence given to the sanctuaries of stone or brick dedicated to the worship of God. There have been vast and costly temples devised by human minds, reared by human hands, and adorned with skillful work; there have been no temples so complicated, so cunningly devised, nor so beautiful and perfect in their construction as our bodies are. There are great ruins of once holy buildings that are sublime, though the glory is not there. The sacredness has departed. The worship rises no longer within their walls. The wild birds, it may be, fly unhindered, where the sacred majesty of the Eternal Father once filled the place. The ivies are rooted and grow unnoticed where once, in a sanctuary, men prayed to God. The traveler rambles unforbid-

den in and lays his unhallowed hands on the desecrated altar. Though there be beauty there, on which we gaze, it is the beauty only of a ruin. But there is a sadder ruin, when the sacredness departs from those temples of God, which are our bodies, and they become unhallowed structures, devoid of reverence or care. From the marble of ancient sanctuaries, *other* buildings have been reared; *our* one temple of the Holy Ghost is the only one that we shall ever have. Is not neglect or injury to it, then not only a sin but a sacrilege?

And if to neglect or injure our health is a sin, then there must be some reason greater than ambition, pride, indisposition, or special business to excuse it. Otherwise, we may find ourselves justifying *this* immorality on the same grounds that another man justifies the immorality of stealing, when he says "I was in a tight place and had to get out," or justifies misrepresentation in his business, by saying that he "could not succeed without it."

And now, if what I have said is true, it follows—

1. That attending to the *public* health, becomes a part of Christian activity and responsibility as truly as attending to public morality. If to care for one's own health is a Christian duty, then to impress its importance on others becomes a missionary work.

Aside from the sacredness of human life, Christian duty is very plain, when a family or a community is sick. But supposing instead of being sick now, the family or community will be, from causes that may be corrected or prevented. Is it not as truly a Christian duty to keep people in health if possible, as it is to restore them when they are sick? If an animal is about to despoil my neighbor's garden, shall I call it my duty to aid him in repairing the damage when it is done, but not my duty to drive the animal off if I can before the injury is actually committed? Is it my duty to help him find stolen goods, and not my duty to protect them when I see a thief after them? Is it my duty to pour oil and wine into the stranger's wounds, when I find him half dead on the road to Jericho, and not my duty to drive off the robbers, while as yet the stranger is not injured?

It follows also—

2. That every proper *means* for promoting health and preventing disease becomes a Christian instrument. If those who present a high aim and meaning of life to men, who give kindness and instruction to the poor, and means of making life better and happier to all, are doing Christian work, are not the doctor, the sanitary reformer, and every one who is removing or preventing bodily or spiritual evils doing the same?

3. It follows that it is a Christian's duty to protest against whatever violates the laws of health. It may be sewers, or wells, or wet cellars, or overwork, or intemperance, or bad habits of any kind. We pity the man whose body is worn out at from 30 to 50 years of age. So far as the cause is preventable it should be preached and protested against as a sin. Providence has often been blamed where men were guilty. When an immature death occurs it is sometimes spoken of as a "mysterious dispensation," when it was as natural a result as for a worm-eaten, worn out, and overstrained boat to go to pieces even in a moderate storm.

I am aware how difficult it is to turn from any ambition at the demand of our bodies. The motives that lead to the undermining of health are sometimes most unselfish. We never expect to pay the penalty even when making ourselves liable to it. A sound mind, a sound body, and a Christ-like character are essentials of successful lives. Not possessing a sound body, it is doubtful if a fully developed mind and character are not impossible.

The next paper of the evening was by Dr. Wight, on "How to Combat Small-pox," and is as follows:—

HOW TO COMBAT SMALL-POX.

BY O. W. WIGHT, M. D., HEALTH OFFICER OF DETROIT.

With the origin and history of small-pox, its etiology, pathology, symptoms, course, varieties, complications, sequelæ, morbid anatomy, diagnosis, prognosis and treatment we have nothing here to do. Our attention is occupied solely with its prophylaxis and its administrative management for the protection of the public.

"From small-pox and love but few remain free" was a proverb of the middle ages, showing the universal prevalence of the disease.

INOCULATION.

The earliest measure for combating small-pox was inoculation, which originated in China and India, and found its way to Constantinople. Dr. Timoni, a Greek physician, who studied at Oxford and settled in the capital of Turkey; Dr. Pylarini, Venetian consul at Smyrna; and Mr. Kennedy, an English surgeon, who traveled in Turkey, sent home favorable accounts of the practice, which were successively published in 1714, 1715, and 1716. The profession took no interest in the matter till Lady Mary Wortley Montague wrote to England from Constantinople a very lively and eulogistic account of inoculation, or engrafting, as it was then called, for small-pox, in a letter dated April 1, 1717. "The small-pox," she wrote, "so general and so fatal amongst us, is here entirely harmless by the invention of engrafting, which is the term they give it.

"There is a set of old women who make it their business to perform the operation. Every year thousands undergo it, and the French ambassador observes pleasantly that they take small-pox here by way of diversion, as they take the waters in other countries. There is no example of any one that has died of it, and you may believe I am well satisfied of the safety of the experiment since I intend to try it on my dear little son. I am patriot enough to take pains to bring this careful invention into fashion in England."

Lady Montague's daughter was the first person inoculated in Great Britain. It was in 1721, and its success, says Dr. Gregory, was complete. In the same year Dr. Boylston introduced the practice on this side of the ocean. Of 244 persons inoculated in America, six died. Two or three deaths of prominent persons in England, about the same time, brought the practice, for a season, into disrepute. Statistics carefully gathered by Dr. Gregory, show that small-pox from inoculation is mild, and that the mortality from it is only three in the thousand.

The vital objection to inoculation is that it disseminates the disease in its natural form, and at the present time it is prohibited by law in most civilized countries.

VACCINATION.

The discovery of Jenner by a "masterpiece of medical induction," as Simon calls it, has given to mankind the only means of preventing natural small-pox. It is not necessary to repeat here the origin and history of vaccination.

It is a well-known fact that diseases which may be conveyed from the lower

animals to man are communicated only by inoculation, not by infection. These diseases, when conveyed to man by inoculation from inferior animals, cannot subsequently be communicated from man to man by infection. Yet such a disease does not lose its identity. Its intensity varies, but not its essential nature. The law holds good to a still greater extent. A disease conveyed by man to an inferior animal can be reconveyed to man only by inoculation, and afterwards be conveyed from man to man only by the same process, although previous to its transmission through the animal it was infectious. Another feature of the disease, however, is not changed: if man can have it but once by infection, he can have it but once by inoculation, after its journey through the lower animal.

Small-pox follows exactly this law. It can be conveyed by man to the bovine species.* It can be reconveyed to man only by inoculation. When thus reconveyed, it can be communicated from person to person only by the same means. Vaccinia is not catching. The disease is essentially small-pox in the cow, essentially small-pox in man when reconveyed by inoculation, essentially small-pox when extended by inoculation from man to man. Small-pox when inoculated from person to person after the Oriental fashion, is very much milder, very much less dangerous, but still infectious, and when it is taken from an inoculated case by infection, it resumes its original severity and danger. The disease, when conveyed by inoculation from the cow, is still less severe and less dangerous, and being incommunicable by infection cannot resume its original severe and dangerous type. Yet when conveyed from the cow, without fault in the process, without intermediate degeneration of the

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* The language of the text would seem too dogmatical, if notice were not taken of the fact that the possibility of conveying human variola to the bovine animal has been called in question.

Applying the logical, or rather the mathematical, process of elimination, which will satisfy the most rigorous demands of scientific form, the question may be distributed into its analytical elements, as follows:

(1.) Can human variola be conveyed to the cow by inoculation alone?
(2.) Can it be, by infection alone?
(3.) Can it be, by inoculation and infection combined?
(4.) Can it be, by inoculation, with the concurrence of epidemic influence?
(5.) Can it be, by infection, with the concurrence of epidemic influence?
(6.) Can it be, by inoculation and infection combined, with the concurrence of epidemic influence?

It is evident, at the outset, that if any one of these questions can be successfully answered in the affirmative, the proposition that human variola can be conveyed to the cow must be regarded as demonstrated. On the other hand, all of these questions must be successfully answered in the negative, in order to demonstrate the impossibility of the proposition.

(1.) Passing over the one success, in ten trials, of Gassner in 1801, as too inconclusive for scientific use, the experiments of Badcock and Ceely may be cited as evidence that genuine vaccine vesicles may be produced in the bovine animal, by inoculation with human variolous lymph. Both began their experiments in 1840, unbeknown to each other. Ceely succeeded twice, when he found that Badcock was systematically working in the same field, and abandoned his efforts. During twenty years, Badcock inoculated 200 cows, some of them repeatedly, with small-pox lymph furnished him by physicians who were treating cases of the disease. He succeeded thirty-three times. His experiments were watched by many medical men. Mr. Marson, a very eminent authority in vaccination, used Badcock's lymph for many years. Sir Thomas Watson, in his famous medical treatise, bears testimony to Badcock's success. John Simon, writing officially in 1857, three years before the close of the experiments, says that more than 14,000 persons have been vaccinated with such lymph, and more than four hundred medical practitioners have been furnished with supplies of it. A detailed account of the matter may be found in an address of Mr. Hodson, delivered before the British Medical Association, at Ryde, in August, 1881, published Nov. 26, 1881, in the *British Medical Journal*.

Per contra, Dr. Klein, under the supervision of Dr. Burdon-Sanderson, experimented on thirty-one cows, with negative results. (See ninth annual report of the Local Government Board of England, for 1879–80.) The Lyons Commission, of which Chauveau was a member, made extensive experiments in 1865, without affirmative results. An Italian commission was equally unsuccessful. The Belgian commission of 1881, including Dr. Warlomont, also failed. Veterinary-surgeon Fleming, of the British War Office, has written a pamphlet entitled *Human and Animal Variolæ*, in which he maintains that cow-pox and small-pox are essentially different diseases.

It is evident, again, that a single uncontested success in conveying human variola to the cow by inoculation, and returning it to man by the same process as genuine non-infectious vaccine pox, establishes an affirmative answer to the question under discussion. Any number of failures in attempted experiments of the kind prove nothing more than the difficulty of performing the operation.

(2.) Accounts of communicating human variola to cows by infection, belong to a realm too shadowy for science.

(3.) We have no facts that enable us even to conjecture whether successful inoculation of the cow with small-pox needs the aid of infection.

matter, it protects just as well as natural small-pox. The imperfect protection, lamentably seen on every hand, is entirely owing to faulty methods of vaccination and to imperfect virus. A small percentage of persons will have natural small-pox twice. The same number will have inoculated small-pox twice. They will also take natural small-pox after vaccination. Partial vaccination, however, will partially protect, leaving the person still susceptible to a more or less severe attack of varioloid small-pox.

I think we should gain something in precision, in exact conformity of language to scientific fact, if we were to discard the words vaccination, cow-pox, vaccinia, varioloid, etc., and use the terms natural small-pox, inoculated small-pox, and vaccine small-pox. A misleading nomenclature causes people to imagine that vaccination is an attempt to prevent one disease by another, against which the instinct of reason occasionally rebels, notwithstanding an overwhelming array of facts in its favor.

PUBLIC PROTECTION BY MEANS OF VACCINATION, OR, MORE PROPERLY SPEAKING, BY INOCULATION OF VACCINE SMALL-POX.

In comparison with the long ages of man's life on this planet, non-infectious vaccine small-pox, or vaccination, is a new thing. Sixteen years less than a century ago Jenner published his discovery to the world. Only eighty-four years have elapsed, yet the most dreaded of diseases to which man is subject has already lost the greater part of its terrors. Against the inertia of indolence and apathy, against ignorance and superstition, against dullness and prejudice, against heavy conservatism and unreasoning tradition, the practice of

(4.) Neither have any experiments been made to determine whether successful inoculation requires the concurrence of epidemic influence.

(5.) Whether infection and epidemic influence combined can convey small-pox to the cow is unknown.

(6.) Whether inoculation, infection and epidemic influence must concur, in order to convey human variola to the bovine animal, although opening a fruitful field of tentative hypothesis, is a question on which not even a single observation, scientifically made, has cast a ray of light.

The argument from the analogy of known facts, in favor of the essential identity of small-pox and cow-pox, is very strong. It is enough to say that no zymotic disease exhausts susceptibility to another. The vaccine of M. Pasteur for chicken cholera is experimentally based on the identity of the vaccine and the disease of which it is prophylactic.

The argument relied on in favor of the essential difference of vaccinia and variola is from their clinical history. The experiment of Thiele, first published in Henke's *Zeitschrift*, in 1839, not only renders this argument baseless, but strongly corroborates the argument from analogy, of the identity of these diseases. "Take some small-pox lymph," says Thiele, "and keep it between waxed glasses for ten days; then moisten and dilute it with cow's milk, and with this inoculate a child. The lymph from this child is again to be kept between waxed glasses for ten days, then diluted with milk, and transferred to another child, and so on—the same process being repeated to a tenth child. By this time the disease will have become as benign and non-infectious as cow-pox, the successive ten children having manifested it in a gradually milder form, the secondary fever and the secondary pustules around the inoculated part having gradually ceased to occur; and thenceforth the lymph may be propagated directly from child to child (without keeping or milk-dilution) just as in ordinary vaccination."

The doctrine of the duality of vaccinia and variola involves one of two things: either vaccinia arises from time to time *de novo* in the cow, or it has a continued existence in the bovine race. Whoever maintains the former must maintain not only the spontaneous origin of species, but also the repeated spontaneous origin of the same species at intervals. Whoever maintains the latter, must maintain a zoological history of unbroken continuousness of vaccinia, or animal variola, in the cow.

There are certain local histories, based on the observation of the common people, attested by the belief of the common people, which throw some light, although not scientifically certain light, on the question of the possibility of conveying small-pox from man to the bovine species. In the midst of the current facts of such a local history in Gloucester, England, Jenner made his great discovery. M. Negri, the originator of propagating bovine virus, three times obtained a fresh supply from cows in Calabria. At Beaugency, in the department of Loiret, France, a fresh "stock" was obtained from an infected herd. A fresh supply was also obtained at St. Mande, near Paris. In 1865, a new "stock" was secured at Esneaux, in the province of Liege, Belgium, which is now propagated under the direction of Dr. Warlomont, at Brussels.

It is certain that when milkers, having small-pox, convey the disease to cows, the animals are subjected to the combined influence of epidemic influence, infection, and inoculation. In my judgment, future experimenters would do well to keep in view all of these conditions. If the federal government shall undertake the duty of supplying the whole country with vaccine virus, here is presented to the National Board of Health a useful field for exhaustive investigation.

Finally, however interesting this discussion may be from a scientific point of view, the practical value of vaccination does not at all depend upon the solution of the question, whether vaccinia and variola are two distinct diseases or modifications of the same disease.

vaccination has spread in a few decades over the whole civilized world, to the vast benefit of mankind.

A few salient facts and groups of facts will demonstrate to any rational human being the immeasurable utility of vaccination, or, in other words, of inducing, by inoculation, non-infectious vaccine small-pox.

(1.) The great mass of people in all enlightened nations have come to believe in it, from observation and experience. *Vox populi, vox Dei.* Enlightened public opinion is a very good, although not infallible, criterion of truth.

(2.) Educated medical men are almost unanimous in favor of vaccination. Simon addressed a question, "purposely construed to elicit the expression of every existing doubt on the protective influence of vaccination," to 542 distinguished medical men, British and foreign, and received an affirmative answer from all but two of them. The British Epidemiological Society published a report of its small-pox and vaccination committee, in 1853, wherein reference is made to favorable answers from more than 2,000 British medical men, besides many in other countries. In America to-day, as well as in other countries, the physicians who do not favor vaccination are exceptions to the general rule.

(3.) The governments of nearly all civilized nations favor vaccination, and some of them make it compulsory. The British and German governments, both of them conservative and enlightened, require it. The legislature of nearly every State in this Union has enacted a law favoring it.

(4.) Statistics on a large scale demonstrate the utility of vaccination. In Moravia, Bohemia, and Austrian Silesia, vaccination reduced the annual mortality of 4,000 in every million of population, by small-pox, to 200. In Westphalia, where the death-rate from small-pox was formerly 2,643 in the million of population, the annual mortality from the same cause declined to an average of 114 in the million from 1816 to 1850, under the influence of general vaccination. From 1810 to 1850 the yearly death-rate from small-pox in Sweden was 158 per million of population, but was 2,050 before vaccination. In Berlin the reduction was from 3,422 to 176; in Copenhagen, from 4,000 to 200. At the close of the last century the estimated rate in England was 3,000. The average rate of 1841–53 was 304. The average of 1854–63, embracing two severe epidemics, was 171 per million of population. Yet there are men, apparently rational, who denounce vaccination, without suspecting that they are making themselves public malefactors.

(5.) Special statistics demonstrate the benefits of vaccination not less strikingly than general statistics. Dr. Seaton and Dr. Buchanan, both of them skilled observers, examined, in various London schools and workhouses, during the epidemic of small-pox in 1863, over 50,000 children. A large majority of them had been vaccinated in various ways and degrees. Three hundred and sixty out of every thousand who had not been vaccinated were scarred with small-pox. Less than two in 1,000 of those who showed evidence of vaccination had small-pox marks. Only one in over 1,600 who had perfect vaccine marks showed pitting from small-pox. Mr. Marson observed and carefully recorded 30,000 cases of small-pox under his personal care in the London Small-pox Hospital. Deaths among the unvaccinated were 37 per cent; among the vaccinated 6½ per cent.

The general drift of statistics on the subject, collected during the current century, is in the same direction. I have no doubt that the present epidemic of small-pox in the United States would be quite as calamitous as the great war of the rebellion, without the protection afforded by vaccination. Were the

protection as perfect as it might have been, we should scarcely know of the existence of small-pox.

DEGREES OF PROTECTION BY VACCINATION.

Efficient vaccination, that is, vaccination with pure virus and properly performed is, in my judgment, just as complete protection against small-pox as an attack of the disease in the natural way. "Duly and efficiently performed," said Jenner, "it will protect the constitution from subsequent attacks of small-pox as much as the disease itself will. I never expected it would do more; and it will not, I believe, do less." Nature does her work perfectly. The element of art enters into vaccination, and the degree of its success depends upon the material used and the skill of the operator. The best vaccinator cannot produce good results with imperfect matter. The best virus may fail in the hands of a bungler. If such grand results in favor of vaccination, as already presented, are attained by work that is imperfect, what might we not expect with the science, skill and pains which are surely within human reach? Failure of vaccination may involve consequences more dangerous to the individual than the amputation of an arm. Yet we seek a careful and skilled surgeon to perform the latter operation, while any blunderhead is supposed to be capable of performing the former. The surgeon is contented with only the best instruments and dressings when he undertakes a capital amputation. Yet, when he undertakes to protect a fellow-being against a disease, which, taken in its natural form, kills four out of ten of all who have it, he sometimes uses any kind of a knife, and exercises less care in the selection of virus than he would in the choice of a sleeve button. As pointed out in one of the reports of the medical officer of the British Privy Council, the degree of protection afforded by vaccination varies as one to thirty. And the worst of it is, that slovenly vaccination, with imperfect or worthless virus, brings the great and beneficient discovery of Jenner into disrepute.

SOURCES OF VACCINE VIRUS.

In order to make clear a subsequent and essential part of this discussion, it is worth while to devote here a few words in explaining how we obtain supplies of vaccine matter. Until quite recently most of the virus used was obtained from the vaccine sore on the human arm. Lymph from a vaccine vesicle seven days old, from the "pearl on the rose," as it was termed, alluding to the red base of the vesicle, was regarded as the perfection of virus. Arm to arm vaccination was considered as the faultless method. Thus from one person to another the supply was kept up. Now, the fashion is to use calves or heifers for the perpetuation of the needed supply. It is supposed by many that calves or heifers are all inoculated with small-pox in order to procure a supply of vaccine virus. The animals are simply vaccinated. It would be rather a serious business to keep a steady supply of small-pox on hand, in order to run a vaccine stable, to say nothing of the extreme difficulty of the operation. The difference between bovine virus and humanized virus is that the former is perpetuated from calf to calf, and the latter from man to man. Both are good. The bovine matter is preferred, for the simple reason that with humanized matter certain dreaded diseases may be inoculated with vaccination. Besides, the production of bovine virus can be carried on in a much more regular way, affording a constant, unlimited supply, as needed. I have no doubt that the danger of inoculating diseases with humanized lymph is greatly exaggerated, but the public is entitled to the benefit of a doubt, in favor of the bovine. A

much greater source of danger is in vaccinating with unclean knives. The blood of a syphilitic person may be left on the point of a lancet and pricked into the arm of an innocent person. The blade used by the operator should be held in a flame after each vaccination.

VACCINATION, THEREFORE, IS THE CHIEF MEANS OF COMBATING NATURAL SMALL-POX.

The problem, how to combat small-pox, resolves itself, in great part, into the practical problem how to get the people properly vaccinated. Preaching and teaching are not alone sufficient to secure the desirable end. The State of Michigan has encouraged vaccination by authorizing local boards of health to offer it free to such as need it, at the public expense. As a mild compulsory measure, the Legislature has also empowered local authorities to deprive unvaccinated children of the privileges of the public schools. A great majority have been vaccinated, more or less effectively. Many, however, have not been vaccinated, and on every hand there is fuel for a conflagration of small-pox. When an epidemic comes, the work of vaccination is done hurriedly, with defective virus. The only effective method of protecting the public against out-breaks of the disease is to make vaccination compulsory, in a systematic way. Organic society, called the State, has the right to protect itself. The principle of public self-protection lies at the foundation of criminal law, of general free education, of many measures for the common good. Society has a right to protect itself against epidemics of a loathsome disease, by enforcing the general application of means approved by the experience and best judgment of the civilized world. European governments are adopting such a method, with excellent results, although the administrative methods are still very defective.

It is not enough to enact a mandatory law. The State, in requiring the vaccination of the whole people within its jurisdiction, is bound to do the work gratuitously, safely and well. As, all things considered, bovine virus is the safest and the easiest to produce in desired quantities, the State of Michigan, in connection with its University, or Agricultural College, and under direction of its Board of Health, should maintain a vaccine farm for the production of bovine virus of the best possible quality, in sufficient quantity for the use of the whole commonwealth. Public vaccinators, examined as to their qualifications and appointed by the State Board of Health, should visit every household and public institution once a year, for the purpose of vaccination and revaccination. Every child in the State should be vaccinated during the first year of its life, and be revaccinated at puberty. The public vaccinators would have much to do the first time they went over their districts. After that their work would be lighter, and to it could be added the duty of local sanitary inspection, whereby a vast amount of vitally useful information could be gathered for the State Board of Health. The public vaccinators should not be allowed to unite any private business with their work for the State. On them should be imposed the duty of initiation of prosecutions for violation of the law they are executing. Registrations of births would aid them, and in turn they could verify and complete such registry. They should be paid by the State, and be as free as possible from local influences. They could also be used as instruments for distributing valuable sanitary information among the people.

It may be objected that such annual systematic work would cost a great deal of money. It is not necessary to repeat here the statistics on which the incontrovertible conclusion is based, that every needless death represents a total loss to the community of at least $1,000. Any death by small-pox is absolutely

needless. If only a hundred deaths a year were prevented in the whole State by the system here recommended, it would be a saving, to the productive energy of the people, of $100,000 per annum. The cost of executing the whole plan, including the constant running of a vaccine stable in charge of skilled hands, would amount to a less sum. The truth is, wise sanitation pays, to say nothing of the loftier aims of preventing sorrow, suffering and death. Besides the direct saving in productive energy by decreasing the death-rate, and, consequently, the sick list, it would be a great gain to the business interests of any community to be ensured against the disturbance of periodic outbreaks of the most dreaded of all epidemic diseases. Expenditure for prevention of small-pox is just as legitimate as expenditure for the humane care of the blind and the insane.

Above all, such a measure, successfully carried out, would be the entering wedge to a general system of State sanitary administration, which, wisely conducted, would save to the people, in productive energy, to say nothing of the sweet blessings of increased health, more than enough to pay all the public expenses of the commonwealth. Old Ben Franklin, with his penetrating, practical intellect, summed the whole matter up in his sharp, laconic phrase, "Public health is a nation's wealth."

ISOLATION AND DISINFECTION.

In the meantime, till some plan of general and continuous prevention can be carried out, we shall have visitations of small-pox, and must use such means as we have to combat it. It must not be forgotten that millions are born into the world every year, who are liable to have small-pox in the natural way. Although miscellaneous vaccination performed with varying degrees of skill, with virus furnished by commerce, subject to the temptations of commerce, costs the aggregate of individuals in the community a good deal more than an effective State system would cost in taxation, the practice, in the meantime, must be encouraged, and such other instrumentalities must be used as experience has proved to be useful. Of course, cases must be reported to the sanitary authority as soon as suspected. Isolation is of great value. A large card on a house, announcing that the disease is within, is very effective, for the simple reason that everybody is afraid of small-pox, and will avoid it when its location is known. Intelligent, thorough, pains-taking disinfection of the place, after the disease has terminated, is essential. During the five months that I have been health officer of Detroit, I have had to deal with 21 cases of small-pox in 12 different localities. Only 7 cases have been taken to the pest-house. In no instance has the disease spread from the house where it first showed itself. All of the cases have been in the most densely inhabited parts of the city. Isolation, vaccination of the household and immediate neighbors, and disinfection, supplemented by a small pest-house for vagrants and those who could not be taken proper care of at home, have entirely prevented the spread of the disease from 12 different foci in a large city.* But it is not necessary to dwell upon the details of municipal sanitary administration.

I wish to say, in this connection, that such satisfactory results were only possible on account of the conscientious and intelligent coöperation of the medical profession in the metropolis of the State.

HOSPITALS FOR CONTAGIOUS DISEASES.

The word pest-house is certainly suggestive enough, and with it are associated many real as well as imaginary horrors. It would be a good thing if use of

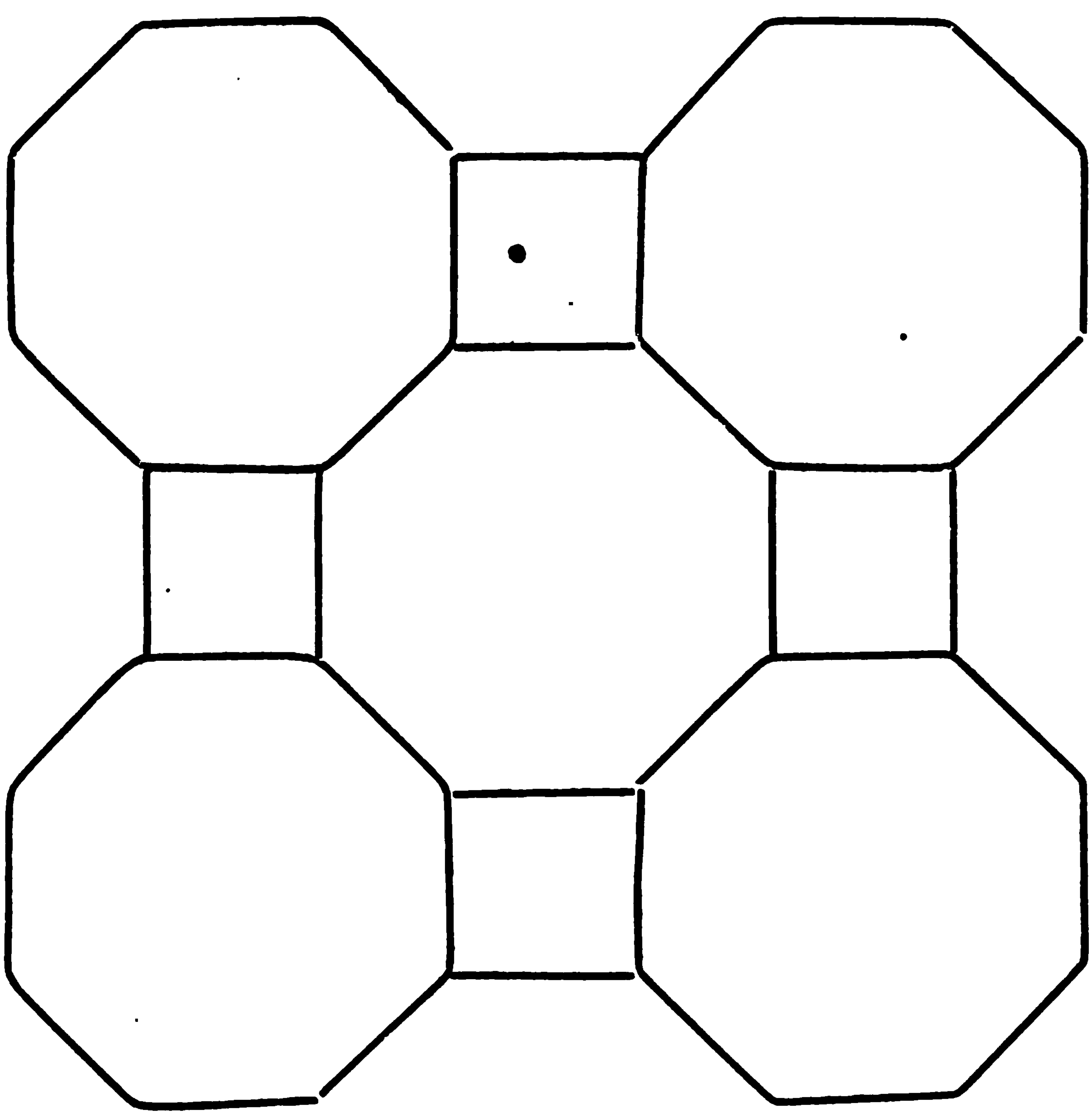
* Up to February 27, the date of this writing.

the term were dropped by general consent. A real hospital, a *hotel-Dieu*, a God's inn, for wise and humane care of the homeless and friendless who are suffering and helpless with small-pox, ought to be attractive instead of repulsive, to those in need of the charity which it offers. Until universal vaccination shall thoroughly protect the public against this disease, it is incumbent on every community that is thoughtful of its own safety, to provide such an institution and have it always in a state of readiness.

It is easy to procure and pitch hospital tents in summer, but epidemics of small-pox generally come in winter. In country places and villages, it is not difficult to find an isolated building for a temporary hospital. In cities, the location of a pest-house, even for a brief period, is frequently attended with extraordinary difficulties. The Board of Health in Detroit has had some experience of this kind during the present season.

A permanent small-pox hospital for a city, so located as to be easily accessible, so constructed as to be safe in a populated neighborhood, so arranged as to afford healthful conditions to its inmates, so planned as to secure isolation, so administered as to be a real home to unfortunates, is a thing ardently desired, but not yet realized. After thinking over the matter a great deal, I have conceived a plan for such a hospital, which I now give to the public for the first time. The plan may or may not have merit, but such as it is I freely and sincerely offer it. I call it

A FLAME-VENTILATED SMALL-POX HOSPITAL.



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Around a central octagon, construct four other octagons of the same dimensions as the central one. There will then be five octagons in the general form of a square. Of necessity, there will be four intermediate spaces, on opposite sides, between the four external octagons. A single line will enclose each of these intermediate spaces, making a square of each, the length of the side of which will be the same as the length of the side of the octagon.

Suppose the length of line chosen is twelve feet. There will then be four external octagon rooms, or wards, about twenty-eight feet in diameter, and four small rooms, or isolating wards, twelve feet square. Let the height of ceiling be fifteen feet. Each octagon ward will then have about 10,000 cubic feet of air space, and each square room about 2,000. Each of the octagon wards would be large enough for five patients, giving to each the regulation 2,000 cubic feet of air space, and 144 square feet of floor space. The small square rooms would be equally sufficient for one patient each. Such a building would be ample for twenty-four patients, without the central octagon, which might be divided into four large bath rooms, with necessary accessories. In case of pressing need, thirty patients might be put into the building, still giving to each as much cubic air space as the famous Herbert Hospital of England affords.

It will be perceived that the structure is limited to one story. In the light of existing knowledge and experience, it would be positively wicked to construct a contagious disease hospital more than one story high.

What are the advantages of such a form?

(1.) Each of the wards can be ventilated by an iron pipe, running from the center of the ceiling up through the roof, in the lower end of which a flame of gas, or of some other material, may be kept constantly burning. A 12-inch pipe going up from the center of the ceiling in the octagon would cause an entire change of air in the room every forty minutes, provided the movement of air in the pipe were five feet per second. A much greater velocity might be gained by letting in a larger supply of air from the outside. A complete change of atmosphere in the ward once in forty minutes, would give each patient the regulation 3,000 cubic feet of fresh air per hour. A 6-inch pipe would do the same service for each of the small square rooms.

The constant flame in these ventilating pipes would not only cause a strong draught upwards, but would consume every particle of contagion in the air from the infected rooms. The constant strong upward draught would cause a perpetual inward movement of fresh air through every crevice, open window or door. No contaminated air could escape from within to poison the outside atmosphere. There could be no accumulation of infection in the wards, for the contagious germs would be reduced to harmless oxyds as fast as generated from the patients. With proper arrangements for disinfecting and washing clothes and bedding, such a flame-ventilated hospital would be safe in the center of a large city.

(2.) The walls of the structure could be made very light, and yet be very strong; for there would be no length of line over twelve feet, and all the sides would be mutually supporting. The thinnest hollow wall would be sufficient. The whole structure could be made fire-proof at a minimum cost.

(3.) The form of the structure is such that none of the larger wards could be entered except through two doors, which should be made self-closing by means of springs.

(4.) Each of the wards has an adjoining room in which a delirious patient might be confined, or a patient about to die might be placed away from the

others. It is very distressing and injurious to the sick, to witness the death of a fellow-sufferer in their midst.

(5.) The form of the building is such that a small portion of it can be conveniently and economically occupied by a small number of patients.

(6.) The form of the structure is such that you can add to it indefinitely, without at all changing the plan, or interfering with the occupancy of the part already built.

(7.) A separate roof can be constructed most cheaply over each section of the building, thus making it picturesque and ornamental.

(8.) The structure is compact, without excluding sun-light and air.

(9.) In the main wards there are no sharp corners for the collection of foul air and contagion.

(10.) The facilities for separating different classes of patients are unequalled.

(11.) If for any reason it should be found desirable to destroy a portion of the building, a piece could be taken out without disturbing the rest.

(12.) Any ward in the building could be disinfected, even with chlorine gas, while the other wards were occupied.

(13.) The roof over each room being separate, there would be no continuous blind attic to convey the foul gases of water closets throughout the whole building.

(14.) No fire-proof building for the same number of patients could be constructed so cheaply on any other plan. Such a building as here described for twenty-four patients, could be erected, with tile floors and slate roofs, for $4,000. It must not be forgotten that each patient is to have 2,000 cubic feet of air space, 144 square feet of floor space, and 3,000 cubic feet of fresh air per hour. In addition to which, the contagium is to be consumed by flame as fast as generated.

This kind of structure for a city, may be placed in the center of a square, surrounded by a high fence along the streets on the four sides, so that there will be no access to the hospital except through a two-story administration building in front, which should contain a dispensatory, reception room, kitchen, and sleeping rooms above for nurses when off duty. In rear of this should be the boiler-room, and near by the hospital should be the laundry, containing proper apparatus for disinfecting with super-heated steam.

If a larger hospital were desired for a larger city, a group of ten octagons in form of a parallelogram, four long, two wide, two central, with eight intervening square rooms for isolating delirious or moribund patients, ample for the care of forty-eight infected persons in the best manner, sufficient for seventy-five in case of special need, even then giving to each 1,500 cubic feet of air space, could be constructed of fire-proof materials for a maximum cost of $12,000, including a good two-story administration building, boiler house, laundry, heating apparatus, etc. It could be disinfected, even to the bricks in the walls, with chlorine gas, and be safely used for cholera, scarlet fever, diphtheria, typhus fever, or other epidemic disease, in the absence of small-pox. Private residences infected with small-pox are not burned down, but are safely inhabited, even after ordinary disinfection.

Recurring to the most important means of combating small-pox, I cannot better conclude a discussion, somewhat lengthy, but not by any means exhaustive, than in the words of Dr. Henry Tomkins, medical superintendent of the fever hospital belonging to the Manchester Royal Infirmary at Monsall, in a paper recently read at Owens College:—

"The most striking of all evidence is, perhaps, that derived from the small-

pox hospitals themselves. Here the protective influence of vaccination is seen and proved in a manner beyond all cavil. At Highgate, during an experience of 40 years, no nurse or servant having been re-vaccinated has ever contracted disease, and evidence of the same character I can myself bring forward, for during the whole time that I have had charge of the fever hospital more than a thousand cases of small-pox have passed under my care, yet no servant, nurse, porter, or other person engaged there has, after re-vaccination, ever taken it, though exposed daily to infection in its most concentrated form. * * * Again, among all the students who during the past two years have attended the hospital for clinical instruction, not one has suffered, all having been re-vaccinated before being permitted to enter the small-pox wards. * * * I defy the most enthusiastic or conscientious of anti-vaccinators to produce evidence like this on his side of the question, or to bring forward even half a dozen persons, choose them whence he may, who have not been protected against small-pox, and expose them as the students are exposed, without more or less of the number taking the disease. Facts such as these should convert the most ardent anti-vaccinator from his folly, and convince him that a weapon of defense so powerful as vaccination should not be left to the pleasure of the individual, but that the State has the right and duty to look after its most thorough performance."

To which may be added the pregnant words of Dr. Wilson of Kelso, requoted after 40 years, by the venerable Edwin Chadwick, at the Brighton Health Congress, in December last: "When man shall be brought to acknowledge that it is by his own hand, through the neglect of a few obvious rules, that the seeds of disease are most lavishly sown within his frame, and diffused over communities; when he shall have required of medical science to occupy itself rather with the prevention of maladies than with their cure; when Government shall be induced to consider the preservation of a nation's health as important as the promotion of its commerce or the maintenance of its conquest, we may hope then to see the approach of those times when, after a life spent without sickness, we shall close the term of an unharrassed existence by a peaceful euthanasia.

This paper was discussed by Drs. Palmer, Lyster, and others. In connection with the subject the Secretary read the following letter from Dr. Foster Pratt, Health Officer of Kalamazoo:

I had hoped to be able to attend the Sanitary Convention at Ann Arbor, but at the last moment must give it up.

I wished to present the idea of an additional function for the State Board of Health—a function, which in connection with the Agricultural College farm, would make both more useful to the State.

Bovine virus will undoubtedly supersede the humanized, and the production of it should not be left wholly to private enterprise. There should be some guaranty of the freshness and purity of the virus, which private interest alone cannot give.

There will be, of course, more or less demand for virus every year; but such a demand for it, as there has been the last six months, will seldom come. The ordinary current demand for it can be easily met and at little cost or trouble. The virus can be so rapidly propagated, however, that with proper facilities, any demand, however great, can soon be supplied.

The outlines of the plan, in my mind, are:

1st. The erection, by law, of a Vaccine Virus Fund of say $2,500, more or less, as may be thought best.

2d. The propagation of virus, constantly, in a few animals—say four or five every month—the number of animals to be increased as necessity may require.

3d. The animals to be raised or purchased by the best official on the farm,—*i. e.*, the best judge of the value and condition of the animal, and the best to handle and care for them while under operation; but all purchases to be ordered by the State Board of Health, or some one designated by it and responsible to it.

4th. The duty of selecting or providing virus, for this work, to be devolved solely, on some com-

petent member of the Board, and the duty of deciding whether the virus from any and all animals shall or shall not be preserved for use, to be devolved also on the same officer.

5th. The rules relative to "points," how they are to be made, and charged, and preserved, and distributed, and sold, to be made by the State Board of Health.

6th. All expenses for the purchase of animals, needed for this purpose, to be drawn from the fund before alluded to, and the proceeds of the sale of all animals so bought and used, after they shall have become salable or fit to sell, shall be paid into the treasury and credited to the same fund; all this also, under such safeguards and regulations as the Legislature and the State Board may deem best or necessary.

7th. The virus to be put up in packages bearing the State Seal and the date of its production, and to be sold at such price as will defray expenses for service, points, packages, etc., etc., so that the "fund," when once established, need be neither much increased nor decreased.

These are the main features of my plan. Whatever the arguments to be urged for or against it, they are so obvious that I need not detail them.

Forty years ago the State of Virginia had, and still has, a "Vaccine Agent," a salaried office paying $1,500 per annum. For ten years, during my practice in that State, I know the working of the idea and plan of a State agency and supervision of this important part of public health, and I speak therefore, from some practical knowledge of the workings of the system,—not wholly from theory.

The system can be adopted by Michigan, without cost to the State, but with great satisfaction if not great benefit, to physicians and people who want the virus and want it good.

You are at liberty to use this or not, as you please, at the convention. I see that Dr. Wight is to read a paper on Small-pox. Perhaps the idea of this letter may be broached by him, or you, or somebody else. If it is this will be of no consequence. My purpose is to make suggestions only.

Yours truly,

Kalamazoo, Mich., February, 1882. FOSTER PRATT, M. D.

[Quite a number of reliable men have invested their money and their time in the business of propagating bovine virus, and have put forth honest efforts to build up a profitable business. It is a business which requires for its proper performance expert ability of a peculiar kind, and unremitting attention in order to prevent entire loss of the stock. There are many difficulties in the way of its successful management by a State; and if undertaken at the present time there would be a certainty of competing with reliable propagators who seem to be capable of supplying all the bovine virus needed. How to protect the people from that other class of propagators of virus—those irresponsible speculators who supply virus of all grades of purity and reliability, is also a question; but it would seem that it must be difficult to do it simply by the State competing in the production and sale of virus; perhaps it may be done by a system of State inspection and supervision, without the State entering upon the production of virus.—H. B. B., Sec. S. B. of H.]

Prof. Henry F. Lyster, of Detroit, member of the State Board of Health, then read the following paper:—

THE AMBULANCE HOSPITAL FOR SMALL-POX.

BY HENRY F. LYSTER, A. M., M. D., PROFESSOR OF THE PRINCIPLES AND PRACTICE OF MEDICINE, MICHIGAN MEDICAL COLLEGE, DETROIT.

At the close of a recent sanitary convention in Flint, as those members who had come from a distance were about taking the train for their homes, they were thrown into some consternation by the chairman of the convention who had reserved his fire to send this parting shot. "You have all come here," he said, "and we have been delighted to meet you. You have called our attention to numberless sources of disease and death, but you have not told us how to detect and correct them. You have spoken of the danger to health from poisonous wells, but you have given us no simple tests by which we can detect impure water. You have spoken of the evils entailed by want of drainage and sewerage, but you have given us no plan by which we may proceed to drain and sewer our homes under conditions which obtain at our residences whether in villages or on farms."

These sanitary conventions, if they are to be productive of the greatest good, are not intended to be merely suggestive and theoretical, but they must be

practical; and while the awakening of the people to the great truths of sanitary science is of the first importance, the ready application of these truths to their every-day life and modes of living, should immediately follow so far as it is possible to make them do so. We have all heard recently a good deal about small-pox, and are all aware that every few years this disease seems to get a foothold, as it were, in the State, and appears here and there usually on some of the great thoroughfares of travel. Small-pox has been present at every port of emigration in Europe during the past year, and consequently it has been largely imported and spread far and wide in our country by immigrants. Fortunately we can boast the enlightenment which has made our people appreciate and practice a very general vaccination, and it is to this fact solely that we are spared to-day a pestilence which otherwise would be decimating our people.

I have here the official reports of the Registrar of Vital Statistics, Dr. Baker, which show how insignificant the proportion of small-pox has been during 11 years in this State, from 1869 to 1879, inclusive.

	Small-pox.	Scarlet Fever.	Diphtheria.
1869	42	252	89
1870	9	852	121
1871	73	696	121
1872	302	565	192
1873	90	578	217
1874	18	440	213
1875	26	423	207
1876	76	399	311
1877	102	404	593
1878	6	429	887
1879	6	418	1,473

While scarlet fever and diphtheria have been very formidable and the latter has been particularly alarming in its progressive increase from year to year, small-pox has only within the past six months become of more than ordinary interest, and is, owing to a very general vaccination, not likely to prevail to any great extent, but on the contrary will undoubtedly rapidly diminish if not entirely disappear. It is necessary, however, in all large towns and cities for the sanitary authorities to be prepared to meet it and to be able to protect the people from it when it is found to be present even in a single case. In the large majority of instances the first cases occur among travelers, who stop temporarily at hotels or other public houses, or oftener still the disease is introduced by some vagrant who finds his home wherever the daylight leaves him. It is not always wise and indeed sometimes not possible for obvious reasons to turn the house where the patient may be found into a hospital for small-pox; and a pest-house, or hospital for contagious diseases should be furnished by every municipality to which all such patients may be transferred. I believe these are facts which no one will dispute.

The plan of cottage hospitals, built and maintained as they are in England, will, we trust, become more general in this country, particularly in manufacturing towns and small cities, in which cases of accidental injury and illness of serious type, occurring not only among the poor, whose homes are but slenderly provided with comforts, but how tenaciously clung too in sickness,— but where that large class who board in private families or at hotels may be properly cared for by scientific physicians and trained nurses under the best

hospital regime, but under more home-like conditions and surroundings than are obtainable at large general hospitals. Yet these institutions when constructed can hardly be directed from their legitimate objects to bear the burthen of a small-pox annex. A permanent pest-house may have certain merits, but however successfully the rules of disinfection may be applied, there are economical reasons which, except in very large cities, or in ports of entry for emigrants, weigh heavily against the advisability of their construction, and relegate them to the past where they belong. The small-pox hospital will deteriorate the value of property wherever it may be situated as far as it can be seen, or at least to the extent of a mile distant in every direction, and people do not like the idea of building a residence on a street through which every case of small-pox will always be brought to reach the hospital.

In the history of small-pox, this fact stands indisputable, that with the decrease of its extension among the civilized world, the mortality from many other forms of disease is lessened. The constitutions of the people do not suffer to-day as they did in the last century, when fully one-tenth of the population died from the effects of this fearful pestilence, and the people are better able to withstand disease than when the latent constitutional affections, when present, were given the opportunity to develop themselves as they will do when the physical system is severely tried and undermined as by an attack of small-pox. The erroneous popular idea that an attack of this disease purifies and renovates the blood, and renders the fortunate survivor more capable and better fitted for the remainder of his life to resist other severe forms of disease, particularly constitutional and cachectic diseases, is only equalled in its falsity by the growing belief in the danger and ineffectiveness of vaccination, as typified in the recent letter of Mr. Bergh of New York, in the North American Review. Mr. Bergh is not the only apostle of this school, but we find them in every city and village of the continent. After the treatment of small-pox had been very beneficially modified by the great Sydenham, of London, in the 18th century, who instituted a change from the depressing and depleting customs then and previously in vogue, and advising fresh air, and the warm bath instead; there came the introduction from the east of the plan of inoculation, the old treatment of the Chinese and Turks, of wonderful effectiveness and value to those employing it, superseded by the remarkable discovery by Dr. Jenner, of the protective value of vaccination. And now, comes from the same country, not only the doubt of the advisibility of vaccination, but the organized opposition to it, and we are asked to relapse into the same unprotected condition as were the people in the last century. If vaccination were not very generally practiced in this State, we would to-day be suffering from an epidemic of small-pox as much more diffused, as our modes of communication are more perfect, and the movements of the people more general than they were in the last century.

I have never seen an unvaccinated anti-vaccinationist, and I do not believe that one can be found in this State. They have generally had themselves and their families well vaccinated before adopting the new skepticism on this subject. The most serious results will follow the loss of confidence in vaccination, as it will lead to negligence and inattention, and worse, opposition, and subvert any attempt on the part of sanitary, and other legal authority to perfect a system of general vaccination, and re-vaccination. We must rely upon this practice to prevent the spread of small-pox. No system of quarantine or hospital management is worth anything in comparison, no matter how rigidly enforced, or how well ordered. Suffice it to say upon this subject, that small-

pox has been, through the universality of vaccination, reduced to a minimum, and while this practice is general, it will be among the diseases least frequently met with. The general weight of opinion among those who have given much thought and study to the subject of infectious and contagious diseases, is against the aggregation of the sick in large numbers under one roof, except under the most favorable management in regard to ventilation and cleanliness, and disinfection. The controversy in regard to hospital construction has been, within the last few years, conducted in the light of large experience and magnificent opportunities. Just as the decision had been given in favor of the pavilion plan and separated wards, the introduction of great cleanliness and thorough disinfection, restored to a certain extent the value of large hospitals, at least the necessity for hospitals in densely populated districts in large cities, demanded their continuance.

The field hospitals in the rebellion and the ambulance hospitals in the Franco-Prussian war, were the same. They were composed of tents of heavy cotton cloth, and were used as flying hospitals, capable of being put up or taken down in an hour or two. The regimental hospital tent was sixteen by eighteen feet, with walls four and one-half feet in height, and with the ridge-pole eleven feet from the ground. This was covered by a tent fly. This hospital could be put up in twenty minutes, and could be taken down and packed up for the wagon train in an equally short time. Many of those present this evening can attest to their excellent adaptation to the service, from long personal experience. I have used them over four years in Virginia in the different seasons, and have treated the various forms of disease incident to the army, in field and camp, including small-pox, without desiring better quarters, or the plastered ceiling and brick walls of the permanent hospital. Tents can be made very comfortable in this climate even in winter for small-pox, and in the warmer seasons of the year they are admirably adapted to ventilation, by opening the walls and permitting the air to circulate freely in them.

When the ship load of immigrants, sick with the typhus or ship fever, lands upon our coast, and the passengers, sick and well, are encamped upon the beach, under the tarpaulins, the germs of this disease disappear as if by magic. The sick, who are not in the very last stages, recover, and few, if any new cases, appear. In a week or two all are well, and the disease has disappeared. There is a very near relationship between typhus and small-pox, both are very contagious and infectious, and the germs of the disease hang about the individual, and the bedding, and the apartment, and while those of small-pox are less destructible and exist a longer time as dangerous elements, yet the general rules which apply to the management of the one are equally applicable to the other. The recovery of patients from small-pox is largely in proportion to their rational management with reference to an abundance of fresh air. Tents may be constructed for convenience, sixteen by twenty-four feet, with walls six feet in height, and the peak or ridge pole, twelve or fifteen feet from the floor. Instead of tent-pins, which are liable to loosen after rain, fence posts could be set in the ground with a top rail extending from one to the other, and the guys or ropes could be fastened to this. In case the weather was severe, and the winds high, boards might be fastened to these posts on all sides of the tent, leaving a gateway for entrance. The most successful way of heating tents is by passing the heat under the tent through a pipe, or having the fire in an ajoining tent, and a chimney at the opposite end out side of the tent, provided with a spark catcher to prevent fire. The heat should, as a rule, be supplied at the floor. The colder the weather the better is a tent ventilated,

the heat is radiated through the canvass, and the air is constantly purified in this way. A stove,—a base burning coal stove is preferable,—may be used, with a sheet iron jacket surrounding it, and a direct inlet pipe from the outside, permitting the cold air to enter the tent inside the jacket, the pipe could be conducted to a chimney at the opposite end and outside the tent. When a double tent wall is needed one tent may be a size smaller and pitched inside of the larger one, thus giving an air space between the tent walls.

Too much light is not desirable in small-pox and sufficient can enter through the tent walls. When a double tent is used windows of small size might readily be used for light and ventilation. Two or more of these wards could be joined together, as I have many times done in the army, and beautiful wards they were with their nice bed-steads and white blankets, and hopeful faces of the volunteers. The floors should be of wooden planks placed upon sills. They need not be fastened together, but may be readily taken up and put down at will.

Wards such as I have described may be put up in a few hours, and when the necessity for their use passes away they may be put up tightly and pans of burning sulphur placed in them according to the rules for the disinfection of rooms and dwellings, 1 lb. to 1,000 cubic feet of space. They may be washed with weak solutions of common carbolic acid and the floors scrubbed and washed with any disinfectant wash that may be determined upon, and afterwards the boards may be taken up and placed in the air and sun and the tent wards opened and left exposed to the air for a week or two, and then taken down and stored away in some dry loft, to be used again when the occasion demands. The exact place where they are stored need not be advertised, and the public will take it for granted that the health board have used their best judgment. This has been used as an argument against the ambulance hospital, but it practically has no foundation. Disinfection can be so thoroughly carried out by the aid of heat and by chemical action of air and other agents, that the tents will not retain the active poison of the small-pox. Huts or barracks may be used instead of tents or in combination with them. These have also been used for this purpose in many different countries and climates, and answer admirably for temporary hospitals. They can be constructed with double walls in winter or single in summer, and the roof may be covered by tarred muslin to keep out the rain. These can be ventilated by windows and doors and may be heated as recommended in the tent hospitals. When a double wall is constructed the lower outside boards may be hung on hinges all the way around the tent, and this can be opened to let in cool air when desirable. On each side of the ridge-pole we may have a similar arrangement. In this way and by windows and by transoms over the doors we can thoroughly light and ventilate the barrack hospital at all seasons and in all weather. The floors may be of plank placed upon sills as already described. The size of the barrack hospital may be about the same as the tent hospital. These could be built so that persons might go from one to the other under cover. In each of these hospitals screens could be used between the beds, and there should be at least two wards for patients, one for the men and another for women and children. These tents could be made in sections so that they might be disinfected and then taken down and stored away the same as tent hospitals. A frame of gas pipe could be made which could be put together and upon this the wooden sections might be placed, or a temporary frame of wood could be erected each time the hospital is erected.

TREATMENT OF DISEASE.

In the Austrian army, 1854, the results of tent hospitals were very satisfactory. The most severe maladies ran their course much more mildly in the free air of tents and recovered more generally and more perfectly than in the confined spaces of hospitals.

EXPERIENCE FROM 1854 TO 1860.

Typhoid fever in its severe forms was treated more successfully in tents than in hospitals, less than 21 per cent of admissions proving fatal in tents, while 30 per cent admitted to permanent hospitals died.

SMALL-POX.

In the tent cases the eruption came out quicker and better and matured more rapidly, and the dessication and convalescence were not followed by any sequence. In permanent hospitals the course was longer, the stages less defined, recession of the eruption was more common, and after diseases more frequent.

WOUNDS AND OUTER INFLAMMATION.

Of all cases treated in tents these showed the most favorable results. In 1859 a number of wounded were sent from Italy. All severe cases were sent into tents, the slighter cases into wards. All the men in tents had a fresh lively look, and contrasted very strongly with those in wards. In the wards, though doors and windows were left open almost the entire day and the greatest care was taken with treatment, hospital gangrene occurred. All this was remedied at once when men were transferred to the tents. In no single case did a gangrene occur in the tents.

Fever and small-pox hospitals have long been established in many large English towns, but in towns of any size it has within a few years become usual to put up temporary hospitals during an outbreak of cholera, small-pox, etc. Ward cubic space 2,000 feet per patient, and 144 square feet floor-space. In winter, warmed to 60° F. For temporary emergencies, tents are recommended or tents advised. (Parkes' Practical Hygiene, p. 335).

In the Franco-Prussian war, 1870–71, and at the siege of Paris, the ambulance tent hospital was maintained during the winter, and with the most gratifying result, "and at all times free from the slightest indication of infection by emanations of organic poison, and the death rate exceptionally low." The stoves should be below ground, and heat carried under the floor of the tent. This was sometimes used in the army camp with excellent effect, bestowing a gentle warmth in the tent.

Dr. Elisha Harris, Secretary of the State Board of Health, N. Y., said in a speech before the American Social Science Association in 1874: "In 1855–7 I caused the costly and imposing brick edifices which the State had erected for hospitals at the quarantine to be closed and locked, and removed all my patients into narrow wooden shanties, ventilated at roof, floor, and between all the beds. The mortality from small-pox and fever was only half as great."

In 1875, I had the honor, in Detroit, of opposing successfully, before the Board of Estimates, the erection of a beautiful brick small-pox hospital near Detroit, basement, cow pasture, and dining room, suits of rooms for the superintendent and medical officers and their families, magnificent cupola, flagstaff, American flag, and all that sort of thing.

This palatial structure was to cost as a first estimate, $10,000, and was to be erected upon a small farm purchased by the city at Connor's Creek.

This hospital has not yet been built, but a less pretentious one has been erected there at a cost of $2,500, but as it was too far out, we do not propose to use it.* I have suggested the ambulance hospital to the board of health at Detroit, and while it has been favorably regarded by the health officer, it has not been adopted. The Secretary of the National Board of Health, and the President of the Illinois State Board of Health both endorse the views of a movable pest-house and ambulance hospital for small-pox in cities. The expense is small.

Water can be obtained by wells, or springs, or drive wells, or can be drawn in carts in barrels.

Communication can be reduced to a minimum,—telephones can be connected with the physician's office or health officer. The right to erect the hospital here and there in outlying lots can be easily obtained either by the power inherent in a board of health or by renting of owner. The fact that it is only for temporary purposes reconciles the people to its erection, and the hospital when again constructed may be in some other quarter of the city. The several points in favor of the ambulance are cheapness, economic management, healthfulness, and freedom from a permanently depressing effect upon the property and a hinderance to the quarter of the city in which it is located.

The following committees were appointed by the president:—

On Visit to the University.—Hon Le Roy Parker, of Flint; Rev. D. C. Jacokes, of Pontiac; C. H. Richmond, of ——.

On Sewer Pipes.—J. H. Kellogg, M. D., of Battle Creek; Prof. A. B. Prescott, M. D., of Ann Arbor; Rev. D. C. Jacokes, of Pontiac.

On Sanitary Publications.—W. J. Herdman, M. D., of Ann Arbor; Henry B. Baker, M. D., of Lansing; Victor C. Vaughan, M. D., of Ann Arbor.

On Resolutions.—Alfred Russell, M. D., of Detroit; Arthur Hazlewood, M. D., of Grand Rapids; Hon. Le Roy Parker, of Flint.

To Report on the Sanitary Condition of the University Hospital.—M. K. Taylor, M. D., U. S. A., Fort Wayne, Detroit; Bela Cogshall, M. D., of Flint; and Professor U. W. Lawton, of Jackson.

The convention then adjourned until March 1, at 9:30 A. M.

THIRD SESSION, WEDNESDAY MORNING, MARCH 1, AT 9:30.

The convention was called to order by the president. The minutes of the preceding meeting were read and adopted. Prayer was offered by Rev. W. H. Ryder, of Ann Arbor.

Dr. Kinne having arrived, his paper which was to be read at the first session, was then read. It is as follows:—

VENTILATION OF BASEMENTS, FILTH, DISEASE-GERMS, ETC.

BY A. F. KINNE, M. D., OF YPSILANTI.

MR. PRESIDENT AND LADIES AND GENTLEMEN OF THE SANITARY CONVENTION:—Dr. C. R. Agnew, in a letter from Florida, says that a dwelling house should have no cellar under it, and that light and air should be admitted to the basement as freely as possible.

I propose in the short time which this convention can afford me, to give you as briefly as possible, some of the facts and recent scientific developments that render the learned doctor's remark not an unreasonable one. I shall not attempt to be original, and I may seem to be somewhat discursive; but I desire in the first place to show you how closely the wonderful discoveries in prevent-

* Total expense of land and building, $10,000. A resolution is now before the city council to sell this property and it is hoped that at least one-half of the cost will be obtained for it.—Aug. 16, 1882.

ive medicine, to which I propose to invite your attention, are connected with what you already know, it may be quite familiarly.

There is a parasitic disease of the growing grain, called rust. Upon pulling up a stalk it is seen to be covered, more or less numerously according to the severity of the blight, with exceedingly minute specks of dust. And to the unaided eye of the husbandman little else appears. But with a magnifying glass each individual speck of this dust is seen to be a perfect vegetable, of the mushroom or toadstool variety, which has found its habitat upon, and is drawing its sustenance from, the stalks of the ripening grain.

Here then is a crop upon a crop; and whence came the seed for these parasitic and most unprofitable little vegetables? The blight extends over the entire field; over the adjacent fields; over the adjacent farms; over the adjacent townships, and in some cases, perhaps, over adjacent States even. There is no lack of seed anywhere. Wherever there is a prevalence of warm and moist and murky weather, and especially wherever the wheat stalks are in the same stage of the natural decay which must always accompany the growth and ripening of the kernel, there the blight is present. It has made its appearance, it may be, in the course of a single night. And the solution of our question can only be found in the wonderfully rapid growth and prolific nature of this very curious kind of vegetation. The fault is with our eye-sight. Human vision unaided fails to detect these germs, although the air is literally alive and swarming with them, of a great multitude of different kinds.

But there are ways in which these spores become indistinctly visible to the naked eye.

(a.) The little brown cloud that is forced by sudden compression out of a puff-ball, is composed of the spores of the dead plant; and as a cloud is quite visible. But if we continue to observe it, it fades rapidly away, and in a few seconds entirely disappears.

(b.) The motes in a sun-beam, which every body has seen, are the very germs of which we are speaking. And they are composed of solid matter, otherwise they would not reflect so brightly the rays of light; and they have avoirdupois weight; like the particles of drifting snow, they are heavier, but only a little heavier than the air in which they float until they finally come to the ground and are most of them lost.

Do we want to be fully convinced that these little bodies are endowed with the principle of life? We have only to place a clean pane of glass in some sheltered nook, and as soon as a little drift of them has had time to collect upon it, sweep them off into a culture-vase, containing a solution of the juice of meat. In a few hours the clear liquid is seen to be turbid, and the microscope discloses the fact, that our specks of shining matter have germinated, and the vase is full of a growing and rapidly multiplying microscopic vegetation.

But the subject which we are here opening up, is altogether too extensive for such a paper as this proposes to be. And for the sake of the point which I hope to make, we must confine ourselves to a few observations upon a single order of these wonderful plants, the Schizomycetæ. This term is derived from two Greek words, *schizo,* to cleave or split, and *mukês,* a mush-room or toadstool. These plant organisms are exceedingly minute, some of them appearing to be mere points, under an instrument of very high power. And as they seem to require almost no oxygen at all, they are well fitted to live and thrive and propagate themselves within the fluids and tissues of living animal bodies. Hence their name; they are tissue splitters; and there are many kinds of

them, some of which are the causes of diseases destructive of life, both among domestic animals and in man.

And it is a curious discovery of recent times, that these queer but dangerous plants can be cultivated. Indeed, if we desire it, we can have a whole green-house of them. We have only to remember their preference for an animal diet, and use for our culture, a little water holding some animal substance, such as meat juice or chicken tea, and so forth, in solution. The common germs of the atmosphere, which, as we have seen, are everywhere present, and which are the weeds of this kind of gardening, must be carefullly excluded by thorough boiling, and by closing the mouth of the vase with a tuft of cotton-wool. And the seed is planted by transferring to it upon the fine point of a glass rod, a tiny drop of blood from the veins of an animal about to die or already dead from any one of the malignant, infectious diseases in question. In a few hours, in a suitable temperature, the liquid in the vase is seen to be turbid, and our cultivation is a success. A small drop of it under a microscope is seen to be alive with germs, the same as those to be found in the diseased animal; and to be sure that they are the same, and that they have lost none of their malignaucy, we can go on to propogate them through a succession of similar vases, or we can infect and destroy a healthy animal by innoculating it with a finely pointed glass rod, dipped indifferently into any one of the culture-liquids.

This, in brief, is the culture of disease-germs; by the practice of which, Pasteur and Büchner made their remarkable discoveries, which I must now bring to your attention;—discoveries of the greatest importance in their application to preventive medicine, and of almost unbounded promise in the way of future developments.

There will hardly be time to give in detail an account of these discoveries, although such a history would probably be found interesting. They may be briefly formulated thus, the main point being the admission of atmospheric air to the contents of the culture vases, or its exclusion, or at least its restriction, when we would reverse the process and secure an opposite result:

First. To use one of Pasteur's terms, no known form of vegetable life is quite anærobic, oxygen in some form and in some quantity, being as necessary to plant existence as to animal.

Second. Pasteur discovered that simply by the admission of atmospheric air to the inside of the vases, in the manner already pointed out, for protracted periods of from four to ten months, between the successive cultures, the malignancy of the germs was gradually mitigated, and at length entirely neutralized.

Third. Pasteur has introduced here the principle of vaccination, and opened up an encouraging prospect of its possible application to a great number of human diseases, as well as animal. By first innoculating an animal with a mitigated virus, and giving to it the disease in a mild form, it was found that a virus of the most malignant kind could afterwards be introduced into its veins without producing any effect. There is a disorder for instance, which in England is called splenic fever or anthrax; in France, charbon; in Germany, milzbrand; and in Russia, the Siberian pest. In France alone, animals are are annually lost by this disorder of the value of 20,000,000f. And as soon as it was announced that a vaccine for this disorder had been discovered, there immediately sprang up a demand for it. And Prof. Pasteur was requested to give a public demonstration of his discovery, the result of which I will lay before you in his own words:

"Fifty sheep were placed at my disposal, twenty-five of which I vaccinated

with a mitigated virus. Two weeks afterwards the whole number were inoculated with the most malignant kind of anthracoid germ. The twenty-five vaccinated sheep resisted the infection; the twenty-five unvaccinated sheep died of splenic fever within fifty hours. Since that time my energies have been taxed to meet the demands of farmers for this vaccine. In the space of fifteen days we have vaccinated in the departments around Paris more than 20,000 sheep and a great number of cattle and horses."

Fourth. "Any of these attenuated forms of virus may very easily, by a physiological artifice, be made to recover their original maximum of virulence." These are Pasteur's own words, and the "artifice" here referred to is simply an apparatus by means of which these harmless germs, through many successive cultures, are forced to live and propagate themselves with less and less atmospheric air.

Here then is the grand principle: a plentiful supply of atmospheric air deprives disease-germs of their virulence, while on the other-hand, a scanty supply of that element restores it.

And Büchner has carried this discovery a step further still, and has shown that a germ entirely harmless by nature, can be transformed by this process of oxygen starvation into a germ of the highest measure of malignity. And upon this point it will pay us to dwell for a moment, for as regards our subject it is a point of very great significance.

It had long been noticed that two germs familiar to microscopists, the bacillus subtilis and the bacillus anthracis, were practically indistinguishable under the instrument; and yet no two growths, in their habits and modes of life and in their intrinsic natures, could very well differ more widely, the former being found growing upon the surface of a fermenting infusion of hay, consuming air in large quantities and being harmless in its nature, and the latter maintaining a vigorous existence, with minute quantities of oxygen, within the blood and tissues of the animals it destroys.

As has already been stated, after cultivating the bacillus anthracis (the germ of splenic fever) for several hundred successive generations, subjected to free access of air, filtered through cotton-wool, Büchner found that the cultivation-liquid was no longer infecting when inoculated on animals. Continuing his cultivation, he found that the germ, which at first grew in the body and bottom of the liquid only, began to develope on the surface as well, first as a greasy scum, but finally as a thick, dry layer. This habit of growing on the surface rather than in the bottom of the liquid is a characteristic of the bacillus of hay, and to make it more manifest that the transition into this germ had actually taken place, the germ was now found to grow readily in an acid hay infusion, whereas formerly it had required an alkaline infusion.

For the converse transformation of the bacillus subtilis of hay into the virulent bacillus anthracis, Büchner devised an apparatus, in which the cultivation-liquid could be kept in constant movement, so as to break up the scum of bacteria found on the surface, and keep the germs as far as possible beneath the surface, and in a condition as regards air-supply approximating to that of the germs in the circulating blood. And after some trials, by using extract of meat for a culture-fluid, he succeeded at length in developing a germ having virulent properties. Rabbits, mice, and so forth, inoculated with them, died of malignant splenic fever, having their blood swarming with the genuine bacillus anthracis.

The sanitary lessons here inculcated will be easily seen and readily accepted:

(1.) It is not necessary and we need not always expect to find disease-germs

existing in a state of nature; it should rather be our care to find out if we can in what culture-liquids, or perhaps in what confined spaces, an ordinary, harmless germ, is liable to be starved for air enough to change its nature and render it virulent.

(2.) The prime purpose of thorough ventilation is not to float away and carry off unwholesome gases, although this also may be of very great importance at the same time. Whether it has been demonstrated or not, it will be safest for us to hold that the malarious diseases, as well as the non-recurring infectious, are caused by disease-germs, and that these can be changed in their natures and rendered harmless by a plentiful supply of atmospheric air.

(3.) The word "filth," while still retaining the whole of its old, unsavory significance, must now have attached to it a new meaning. It developes unwholesome gases of course, and of course it nourishes disease-germs, and it must also furnish the situations where even harmless organisms are deprived of air, and are thus rendered malignant.

(4.) The most dangerous situations about every man's premises must be his cellar, his basements, and especially such confined spaces, whether damp or dry, beneath his floors, as cannot be freely ventilated.

In 1872 diphtheria broke out in the family of Mr. J. R., of my city, and carried off three children in rapid succession. I was called to see the fourth patient, and traced the infection to the cellar. This extended under the whole house, and was not filthy as that term is ordinarily understood; but it was very damp, always contained water, and had never been disinfected or thoroughly ventilated. I ordered the removal of all the children left alive, out of the house. The sick one recovered and the other two did not take the disease.

I had a similar experience in the family of Mr. A. W., in 1875, and in that of Mr. A. F., in 1876. In both these cases I thought the disease traceble to closed spaces under the floors, that could not be ventilated; in both, removal of the children was resorted to, and all the children, alive at the time of such removal, either recovered or did not contract the disorder.

Such cases could doubtless be multiplied indefinitely, but one more must suffice:

"The sloop Mary, from a healthy port, was sent into Philadelphia as a prize in 1791. Her cargo was removed, the decks washed, and the hatches and ports shut without accident to any one employed in the work. In this closed condition she lay during three weeks of very hot weather, when a very offensive smell of bilge-water was traced to her. Her ports and hatches were thrown open; torrents of foul air rushed out, spreading a suffocating stench for a considerable distance, and a number of cases of yellow fever, the first in the city developed in persons exposed to the offensive vapors. Here we find the hitherto harmless contents of the hold developing virulent properties under combined influence of heat, moisture, and especially of a limited supply of air." It was not a filth case in any ordinary sense of the term, for the hold had just been cleaned out; and the stench spoken of was due to the offensive germs with which the air was loaded, and of whose presence in any situation our olfactories are always our surest detectives.

To construct a ship without a hold, or a house without a basement, is of course, an impossibility, and these spaces are always likely to be damp and mouldy. But we can study the life and habits of these lower forms of vegetable life, and take our sanitary precautions accordingly. And these are:

(1.) Unremitting attention to cleanliness.

(2.) White washing, or better, washing of all exposed surfaces with a strong solution of copperas.

(3.) Fumigation with chlorine, sulphurous acid, or any gas known to be fatal to vegetable life.

(4.) Ventilation; and for the additional reason, that air is potent to render pathogenic germs harmless, and the want of it to transform harmless germs into pathogenic.

Cess-pools and sewers and privy-vaults and the graves of dead animals, are vastly more dangerous to health than are cellars and basements; this is obvious. But the time of this convention is limited, and we must confine ourselves to a single topic:—the universality of germs, and the liability of their becoming the germs of disease simply by the exclusion of atmospheric air. And the lesson of this paper is, that closed spaces should nowhere be permitted to exist, under ground or above ground, in the vicinity of human habitations; and that it is not enough to know that such spaces are dry and clean, the main point being to avoid the cultivation of organisms that can subsist without much air in the fluids and tissues of our own bodies.

Dr. Prescott showed by a simple device how easily the air may pass through the soil.

Rev. D. C. Jacokes spoke of the great necessity of keeping the basements clean.

Dr. Smith, of East Saginaw, mentioned many cases of diphtheria in houses whose cellars were connected with sewers.

Dr. M. K. Taylor explained the necessity of ventilating sewers with air-shafts. Every house should have a ventilating-shaft extending above the roof.

The next paper was by C. P. Pengra, M. D., of Ovid, entitled "The Purification of Water by Freezing." It is as follows:—

THE PURIFICATION OF WATER BY FREEZING.

BY C. P. PENGRA, M. D., OF OVID, MICHIGAN.

The purification of water by freezing is a question of considerable importance, and although intimately connected with hygienic work, seems to have been quite overlooked in the past. It is admitted that there is no absolutely pure water in nature, the nearest approaches being the distilled, rain, snow, and ice waters, and as regards impurities of either—and one's opinions must naturally be formed from a knowledge of the source—the immediate conclusion would seem to be that ice-water passes through the most favorable conditions for contaminations, and would also seem that from this fact alone more good would come in the way of greater discrimination in its harvest; but people have lived, and the same people have used impure ice, and with this experience of the ages as a guide, the public stamp of "*custom*" has been sufficient to prolong and increase the practice. The general opinion being that the process of freezing is a ready and sufficient means of purification, the result of which has been to use "ice-water" from any and every source and for all purposes. The few exceptions to this "general opinion" are to be found among scientific men, and so careless have been their observations and especially their reports, that the public are scarcely warranted in admitting their reliability. For example: Pavy in his study on "Foods," says that purification of water by freezing is not complete, common salt (Na Cl) can often be tasted in ice. And even Hassall, from whom only I have been able to obtain any results of analyses, states that ice-water is one of the purest in nature, owing to the very beautiful and remarkable fact that in freezing,

which is an act of crystallization, all or nearly all substances or impurities, whether gaseous, organic, or mineral are cast out and may be found in the unfrozen liquid. That a well known illustration of the fact is afforded by icebergs, which, although formed from the sea, yet when melted consist of water in a state of great purity. Remarks like these, supported by but one set of experiments, are evidence of the source of the general opinion of which I have spoken.

No one will contend that all ice is equally no more than that it is absolutely, pure, but will in all probability admit that our aim should be to appropriate that the most pure and wholesome. With this end in view, at the instigation of Dr. Vaughan, we have been induced to make a series of experiments, by no means at an end, but the results of which to date have been as follows:

Our first experiments were with crystalloids, and first of these with urea dissolved in distilled water and afterwards estimated by Leibig's method.

100 c. c.* of which before freezing contained .83 grams.†

100 c. c. of which from ice contained .50 grams.

100 c. c. of which not frozen, contained 1.3 grams.

In other words a "casting out of .33 grams, or 40 per cent, by freezing.

The second experiment with urea as found in normal urine, and estimated by nitrogen:

7300 c. c. before freezing = .91 of 1 per cent.

165 c. c. from ice = .42 of 1 per cent.

Showing a purification of 53 per cent by freezing.

A third experiment with grape sugar in which—

100 c. c. of original solution contained 1.5 grams.

100 c. c. of ice contained .96 grams.

A purification of 55 per cent by freezing.

In the fourth experiment arsenic (As_2O_3) was dissolved in ammonia (NH_4OH) and diluted to 1000 cubic centimeters with distilled water, as analyzed by Mr. T. H. Hubbard, of the Pharmacy department.

1000 c. c. of original solution contained 1.78 grams arsenic (As_2O_3).

500 c. c. of ice solution contained .48 grams arsenic (As_2O_3).

500 c. c. not frozen solution contained 1.3 grams arsenic (As_2O_3).

A 40 per cent purification by freezing.

I may also add just here the one experiment by Hassall, in which a part of the water was frozen artificially.

	In the Original Solution.	In the Ice.	In the Water left.
Total solids	27.0	3.0	14.2
Chlorine	1.94	0.9	—
Lime	10.53	trace	14.11

The deductions from which would tend to prove more purification than in the former cases.

Our next observations were of colloids, and we regret that they have been confined to albumens, but since they are quite constant as to results, the three will be better proof of the one fact.

In the first, about 1,000 c. c. of a solution of egg albumen were frozen solid.

50 c. c. of the upper third contained 3.015 grams.

50 c. c. of the middle third contained 4.19 grams.

While 50 c. c. of the lower third contained 6.87 grams.

* One c. c.=one cubic centimeter=.27 fluid drachm.
† One gram=15.434 grains.

Showing a gradual but slight purification from above downwards.

In the second experiment with albumen as found in albuminuria,—

50 c. c. from ice contained .5 grams.

50 c. c. from unfrozen contained .8 grams.

Or a purification of about 20 per cent.

In the third experiment with egg albumen,—

50 c. c. of original solution contained .25 grams.

50 c. c. of ice solution contained .21 grams.

50 c. c. of solution left contained .35 grams.

A purification again of about 20 per cent.

As will be noticed, the purification of crystalloids is at least 30 per cent greater than that of colloids.

It is obvious that these results must vary with the rapidity of freezing; but as these specimens were frozen naturally and under the varying temperatures to which common ice is subjected, they may be regarded as even more applicable to the general purposes of sanitary work.

The conclusions drawn from the foregoing were quite beyond our expectations, not supposing that there would be so great purification as has been evident. But while this information has been somewhat of a surprise, it is also sufficient proof that we cannot, as sanitarians, admit the indiscriminate collection of ice, as is too often practiced, but should lead us to earnestly endeavor to persuade the public that pure ice can only come from pure water.

That ice from water of cesspools or water receiving foul drainage, as from sewers, barns, privies, cemeteries, cellars, or containing any dead and decaying animal or vegetable matter, or from muddy streams or shallow and stagnant pools, cannot be pure, and the practice of gathering and using such is absolutely injurious to health, even if used for no other purpose than that so common of packing poultry or any fresh meats.

In other experiments, which we hope to complete in the near future, we shall attempt to estimate the purification if any as affecting the numerous organisms so common in water.

Since writing the above, I have read a paper as presented by Dr. Orlando Brown, and printed in the Second Annual Report of Connecticut State Board of Health, recording instances in which it was demonstrated beyond doubt that very serious disease resulted from using impure ice; he regards albuminoid ammonia as a reliable indication of contamination when excessive, and when accompanied with but little free ammonia (NH_4) and no evidence of chlorine its presence indicates vegetable decay, the products of which contaminate water; whereas, the presence of chlorides indicates contamination from animal decay. The report as a whole is but evidence of the necessity of extra precautions in sanitary work.

C. P. PENGRA.

Prof. A. B. Palmer complimented the paper as one of great practical interest. Dr. M. K. Taylor stated that much of the ice supply for the city of Detroit was obtained near the openings of the sewers.

Dr. Wight, health officer of Detroit, promised that this matter should be investigated.

Judge N. W. Cheever then spoke at some length in favor of the adoption of the dry-earth system for disposing of refuse matter.

Dr. H. C. Fairbank spoke of the inability of health officers to compel persons to keep their premises clean.

Dr. Breakey stated that health officers needed the aid of the community at large.

Prof. Prescott urged the abolition of the privy system.

Mr. Ellacott, of Chicago, thought that sewers can now be made so tight that gases cannot escape.

Mr. Israel Hall, one of the vice presidents of the convention, then read the following volunteer paper:—

STRAWS POINTING TOWARD PREVENTABLE CAUSES OF DISEASE.

BY HON. ISRAEL HALL, OF ANN ARBOR.

Being neither physician nor scientist, what I shall say will be general in its bearing, and suggestive in its character, rather than particular and technical in its application. So, if you please, think of the incidents I shall relate as so many straws pointing toward preventable causes of disease.

Fifty years ago I began to travel in the middle States, which brought me in contact with diseases, common and uncommon, to that portion of the country.

For many years during the early settlement of the middle States, I well remember that the people in the low lands and valleys were bilious, sickly, and beggarly poor, while those on mountain sides and hill-tops were robust, healthy, and highly prosperous. Yet, in that early time, scarlet fever, diphtheria, and typhoid diseases were alike almost unknown to both valley and hillside. Nevertheless, when these malignant diseases did appear, strange as it may seem, the mountain sides and hill-tops were the first and most seriously afflicted. So marked was the field of these much dreaded scourges, that many supposed typhoid diseases were peculiar to highly cultivated farms in elevated and salubrious districts, and also that robust families were its necessary victims. Please bear in mind that the high lands, with natural drainage and free from bilious diseases, were thickly settled and highly cultivated, while the low lands had but a sparse population, living in shanties, and shifting from place to place as trivial occasions required.

Bearing these facts in mind, I will digress to a few other points before giving my theory as to why the seemingly healthy portions of the country were most seriously afflicted by those dreadful diseases. Going back to my early recollections of disease—sixty years ago—during a hot spell in June, an uncle and his robust family, living on the foot-hills of the Green Mountains, and boasting the largest dairy in America, were so suddenly prostrated with malignant typhoid fever that many supposed the family had been maliciously poisoned. Some years after their physician told me that if "Uncle Ned" had increased the number of pigs in the field behind the barns to correspond with the augmented supply of whey during the flush pastures of June, that neither he nor his family would have had any experience with that fearful disease which so nearly sent all to their graves. For a long time, while living in Central New York, and traveling through New England and the Middle States, did I find villages on the beautiful hillsides prostrated with scarlet fever, diphtheria and typhoid diseases, as if smitten by an avenging Providence. Years after when I came to know that putrid animal matter and the excrements in water closets were not only offensive but also highly poisonous substances, and that the three-foot ditches on my farms drained the lands for several rods on each side, I began to think that burying the dead on high lands near town, with privy vaults on the upper side of the house, made the water from twenty-foot wells on the other side highly poisonous.

These facts and many others, show the fallacy of the old belief—that

cleared lands and highly cultivated fields necessarily produce new diseases, or change them from a bilious to a typhoid type.

Frequent additions to hilltop cemeteries and the filled up cesspools of water-closets, have as surely been the source of untold disease and death as it is certain that water will run down hill. The ten, twenty, and fifty-foot wells of farms, village and city, though nicely banked on the surface, are still as surely the natural drainage for everything higher as are the three-foot ditches in my farms the natural drains for the surface-water on each side. The deeper the ditch the greater distance will it drain. Think of a thousand cases of diphtheria the last year in the little city of Grand Rapids.

Providence, or the law of our being, fairly understood, is no respecter of persons or places. Be assured, there is a legitimate and preventable cause for that dreadful visitation of disease, and that the same causes which have made Grand Rapids and many other places seem to be the home of peculiar types, will also produce the same results elsewhere.

Fifty-eight years ago the Erie canal was completed through the swamps and undrained lands of Central New York. Its station-houses and villages were necessarily on those undrained lands, with waters in cellars and wells at the same level, but none fit for use. Soon after the completion of that highly valuable thoroughfare, Asiatic cholera was imported from Europe, and landed in the lower wards of New York city, where business men from all parts of the inhabited west, came in contact with it. At that time travel through the middle States was by stage, over the well drained hillsides, or on the Erie canal in packet boats. Though the travel by stage was many times greater than by canal, the villages on the turnpike roads seldom had a case of cholera, while the villages and stations along the canal were most fearfully scourged, one-third dying in twenty hours from attack. Now, however, the lands along that canal being well drained, and highly cultivated are said to be as healthy as those on the turnpike roads and hillsides.

Many years ago, where the charming, healthy, and prosperous city of Syracuse now is, was the most filthy and sickly village ever known. A few families adopted the plan of being indoors one hour before sunset and one hour after sunrise. Those families escaped all bilious and malarial diseases, showing that the poisonous emanations rise by heat of the sun, and fall with its waning influence.

Less than twenty years ago, during a hot week in spring, in a village noted for its salubrious climate, near half the students of New England's most popular seminary were suddenly prostrated with a fearfully malignant disease. So many died that nearly every State was draped in mourning for the dead of that school. Investigation showed that most of the young ladies, whose rooms fronted on the streets were exempt, while nearly all whose rooms had windows facing the rear, were fearfully sick. Further investigation showed that the water-closets had filled and saturated the porous soil during winter and early spring.

Ten to fifteen years ago I was familiar with Chicago, and boasted on its possibilities like a veritable resident. With the pure, deep waters of Lake Michigan on one side, and surrounded by clean, highly cultivated lands in all other directions, and three millions just expended to perfect river drainage, I fondly believed that, besides its other eminent advantages, it had also the possibility of being one of the healthiest cities in the world. Therefore was I terribly shocked in the spring of 1876 to read how dreadfully the city was being

scourged by sickness and death from diphtheria, scarlet fever, etc. It was called epidemic and general. My knowledge of the sanitary possibilities of the city made me feel there must be some great mistake about it. I could not rest until I had learned all the details. Investigation showed that the disease was confined almost entirely to the streets along the river and mostly on the south branch, where there were many slaughter-houses and bad sewerage, proving conclusively that the disease was endemic and not epidemic, and clearly dependent on preventable causes.

A few years since, the people of Toledo were greatly alarmed by the sudden appearance in their midst of a very malignant disease, from which the patient seldom lived more than one day from first attack. Investigation soon showed that all attacked were young, ranging from 12 to 18 years of age. It was also found that all were students in the Jefferson street school, and further effort resulted in the belief that the drinking-water was poisoned by leakage from the cesspools of the water closets. The school board denied the possibility of connection between the cesspools and the drinking-water, but when the students ceased to use that water the fearful malady was ended, and nobody was suspected of the poisoning.

At another time, I returned from a ten days absence, and was told that my healthy, rosy-cheeked neighbor so-and-so was dead, and the rest of her family were very sick with typhoid fever. The family were fine specimens of robust health, and their dwelling in an exceptionally healthy neighborhood. I felt greatly puzzled to account for their sickness, but I did not cease to investigate until I found that in the hurry of spring work the cleaning of their vegetable cellar had been left for a leisure time, in rainy weather.

Another time, a neighbor, who was remarkable for uniform, robust health, and equally remarkable for the scrupulous neatness of his cellar, out-houses, and all pertaining to his ample and highly cultivated grounds, was suddenly prostrated with typhoid fever, and held to his bed for many weeks. Again was I puzzled to account for it on any known principles of philosophy. Investigation, however, brought out the fact that just previous to his sickness he had, on an empty stomach, assisted in cleaning and adjusting the clogged-up sewer-pipes, which ordinarily enabled him to keep his premises in such salubrious condition. These facts again relieved Providence of crime, and enabled us to trace the disease from legitimate cause to resultant effect.

The saying, that a green Christmas makes a full graveyard, is sometimes literally true, but not necessarily so. To the villager or farmer who throws all garbage out the back door, and leaves the carcasses of half-starved animals scattered about to be buried by the snow, a green Christmas and warm winter will surely bring disease and sometimes death; but to clean, well kept places frost and snow are not a requisite for good health.

Thus could I trace—did time permit—many cases from probable causes to resultant effects, which, in my ignorance of hygienic laws I then laid to the workings of a mysterious Providence, when in fact, Providence had nothing to do with it.

In considering the stealthy and insidious action of the cholera in 1832, I omitted to state that most of its victims were men in apparently robust health, while the women and children, living on the same undrained lands, mostly escaped. In my belief, that nothing occurs outside of truly philosophical principles, I have often thought about that seeming contradiction of my theory. Now I recall to mind that a few years before that time I was a boy, detailed to carry whisky from one side of the field to the other for working

men to brace against the heat of summer, and to bring it out, morning, noon, and night, to keep them from freezing in the cold of winter. The poor water along the line of the canal made the use of whisky seem a double necessity. So, as a rule, men drank two sips of whisky to ward off the bilious effects of one glass of water, while the women drank tea, and the children lived on milk. Men also used enormous quantities of tobacco, so that, in my opinion, tobacco and intoxicating drinks were the inviting causes of the direful havoc made by cholera along the canal in that year.

The subject of school hygiene, on which the next two papers on the program were to treat, was postponed until the afternoon session, in order to allow the school teachers the privilege of hearing the papers.

Rev. George Duffield, D. D., of Lansing, then read the following paper:—

HYGIENE AND THE CLERICAL PROFESSION.

BY REV. GEORGE DUFFIELD, D. D., OF LANSING, MICHIGAN.

What little I have to say in this unpretending paper on hygiene and the clerical profession, is chiefly in the form of confession for past ignorance and delinquency on my own part, and of practical suggestions as to the best way of avoiding similar delinquencies on the part of others who are younger in the profession, and who, to this extent at least, will hereafter be the less excusable. With the same light 30 years ago as now emanates from this and kindred associations, I trust I would not have been so ignorant or made such egregious mistakes. As with Paul's epistles, it may be objected there is too much personality in the paper. But personality is not always egotism. Personality speaks the truth, and shames—himself if necessary. Egotism only vaunts his knowledge, and courts applause. "Let those teach others who themselves excel." I come simply as a learner, to hear some of the latest discoveries in this philanthropic science, and like the broker or middle man, to bring the producer and consumer together. As in all social questions the thorough diffusion of knowledge is an essential factor, so with the science and art of preserving health, of increasing and improving it as well, and so preventing disease. The learned man, if he be not practical, is only useful to the learned; the wise man alone, is equally useful to the wise and simple, according to the true saying of Milton:—

> "So apt the mind or fancy is to roam
> Unchecked, and of her roving is no end,
> Till warned, or by experience taught, she learns
> That not to know at large of things remote
> From use, obscure and subtile, but to know
> That which before us lies in daily life,
> Is the prime wisdom."

Having had some warnings which I neglected to my cost, and some severe experience, by which I afterwards tried to profit, you will pardon me if from this experience I take a few leaves.

My first teacher in hygiene was the Asiatic cholera, especially when it made its unwelcome return; and a terrible teacher it was. Originating as an epidemic directly from sanitary neglect, and fed by filth as a fire by wood, we were taught sanitation of necessity; that besides such a remedy as the cholera mixture, there was such a prophylactic as chloride of lime; that disease was in decayed vegetables, and health in rice; that it was safer to see a patient or attend a funeral on a full stomach than an empty one, and above all that there was no more predisposing cause than fear. Having been taught by two

ministers of the same name and surname (one of whom twice had this epidemic but still maintained his post, and the other, who died at his post from another epidemic equally fatal), that it was our duty to follow in the steps of Basil and Cyprian, and Chrysostom, and the immortal Vincent in the great plague of London, we dare not flee with the hirelings, but chose rather to believe that "Duty's path is watched by guardian angels." By strictly observing sanitary regulations, myself and family, though exposed to all the danger of our less fortunate neighbors, by the blessings of a kind Providence, escaped every one of us. That year at least the Protestant clergy did not suffer in comparison with the Catholic clergy, as the former did so deservedly during the prevalence of the yellow fever in Philadelphia in 1796. I have a further cause of gratitude in the fact that during that summer I bade a long farewell to a chronic and hydra-headed dyspepsia.

My second teacher in Hygiene was war, "grim-visaged war."

Too long and too close proximity to the embalmer's tent and regimental latrine at Bermuda Hundred, Va., in July, 1864, when the thermometer stood 104°, when the water of the James river showed all manner of living abominations without a microscope to magnify a single drop 100 diameters, when day and night it was a dead and fatal calm; when "the hundred day's men" were dying off like sheep, and buried like them, without beat of drum or funeral service,—this undesirable proximity I say, was naturally followed, to myself and other of my Christian commission friends, by a severe and well nigh fatal disease. The moment when the wind shifted a single quarter and sent that nauseating odor in another direction, was as memorable as the odor itself. Wherever I may smell it again I shall certainly recognize it as an old but very unpleasant acquaintance, and give it a very wide berth. It is said that there is a great deal of human nature in mankind generally, and I partly believe it. If the real truth that lies at the bottom of the well must be confessed, we were perfectly willing that our white flag should continue to stream in the new direction, and that other nostrils should know what ours had known. Thanks to a previous and somewhat similar experience on the field of Gettysburg, when the steaming ground and murky atmosphere was surcharged with the stench of the unburied horses and half buried men, I had something with me more agreeable than the sanitary smudge. But for that precious *vinaigrette* to stay the ceaseless nausea, I verily believe I would have stood as good a chance of being buried as the rest. Whether French aromatic vinegar comes within the orthodox list of sanitary deodorizers I am not learned enough in the materia medica of the science to determine, but if there is any better agent for this given purpose I would gladly know its name against any future contingency.

From that time forward I began to take a new and deeper interest in the work of the medical inspectors of the sanitary commission, and in the various police regulations of the camp, in reference to its tents, and streets, and latrines, and hospitals. But for these wise precautions, scurvy, and diarrhea, and dysentery, and typhoid fever might have been more formidable enemies to Gen. Grant "while he was holding Lee by the throat," than the army at Richmond. Sleeping over pig-sties, and cellars filled with stagnant water, if report said true, were fatal to other officers besides Gen. Ormsby Mitchell. Yes, there were other dangers besides the minnie bullet and the bomb-shell.

Too much of the information, however, so dearly obtained, was soon forgotten. While the bells were yet ringing because Richmond was taken, I was called to a church in Illinois. The most convenient place to board was a hotel;

the only room to be had one on the ground-floor, the windows of which looked out on the back door-yard, where the debris of the winter had been thrown. Suddenly the sun came out with a burning heat, and it took just nine days to bring on a miserable form of disease that lasted me all summer. But this experience I also turned to profit. Sick of the unwholesome flat where there was no breeze and no drainage, and no good water, I bought for my family a house on the hill, where there was the best of water and drainage, and a prairie breeze into the bargain. Of course the investment was a pecuniary loss, as I knew it would be, but to my family the loss was more than compensated by a sanitary gain. By this time I ought to have learned a little to some purpose about malaria, and its different forms of disease, and their various producing causes, but I heartily confess that in this respect either through apathy or ignorance like so many others, I was "very slow of study."

Having occasion to change my home to a more northern city, I was indeed careful to choose a house as nearly as possible like the last, but after residing in it two years, as my landlord had done before me, I found that handsome as it was and well situated, it had one terrible and yet most truly ridiculous defect. The temple of the Goddess Cloacina had been wisely placed at the extreme end of the back building, the little chimney was quite high, as it always should be, but such is sometimes "the total depravity of inanimate things," that it was ingeniously prevented from doing its duty by a square and close fitting piece of board at the bottom. Its sanitary utility could not have been more effectually prevented by nailing that same accidental square board tightly over the top. When the wind was in a certain direction the odor was as pestiferous as that of the embalmer's tent, and but for the liberal use of the best of disinfectants the history of that chimney might have verified one of the Scotch-Irish myths of my youth I used to hear in old Pennsylvania, viz., that in every haunted house (and there was always one or more thus afflicted in every borough), the evil spirit was accustomed during the day to retire to the vault of the aforesaid temple, and after candle-light was ended to direct his troubled footsteps from the cellar to the garret of the house. That old myth still enwraps a new truth. There is many a house that is haunted still—and the name of the evil ghost is malaria. From the house of which I have just spoken, I afterwards moved into a hotel, our rooms very eligible—third story front—sun and breeze summer and winter; no malaria here! But I was mistaken. In the basement barber-shop the nose and the lungs at once recognized that there was something wrong. The barber when not employed at his chair, was generally out on the street at the top of the steps. One barber after another was taken sick and left, and I never entered the shop when I had time to go elsewhere. But the thought that this noxious exhalation, now familiarly known and widely execrated as *sewer-gas,* would ever work its way out of the basement up through the lath and plaster of walls and partitions, even through a brick partition as if it was not there, into my very bed-room, never occurred to me, until one day I was pronounced by the physician a case of spotted fever, or cerebro-spinal meningitis, he did not know which. Not until six months after, I learned from Professor Alonzo Clarke of New York City, that the true name and nature of my disease was malarial fever, terminating in the fifth pair of nerves—tooth ache, earache, faceache, eye and head ache—all in one. The source of the trouble in the basement it was afterwards discovered, was a choked drain, but whether in consequence of pipes eaten by rats or putty joints, or lead pipes corroded, or imperfect joints, or any other of the numerous defects of drainage, this deponent saith not. He will only add

that six years after that drain had begun its fatal work again, and he had the pleasure of exposing it, and receiving the proprietor's thanks for the same. Saturday last I saw him at Jackson. He said the drain was a wooden one turned just at that spot at a right angle. A straight brick drain cured all the trouble.

Would that I had known enough at the time, and as a minister been sufficiently thoughtful and conscientious to point out a similar danger elsewhere. It would have saved me many a painful regret since. Some three or four miles from the city lived a worthy couple and two nice daughters. Frequently I would hear of their illness, and call to see them, but it was only "fever and ague," and quinine would soon kill "the spores," and set them all right. One hot midsummer day, wanting a drink of water, I went to the well, and finding it very shallow, taking in the surface-water, in close proximity to a horse-pond and cesspool, the water covered with a green slime, I lost all thirst for such water as that, and warned my friend against any further use of it by himself or his children, but the warning was unheeded. One daughter died, then the other; the poor childless parents turned their backs on the land they had redeemed with so much labor, and heart-broken went I know not where. Ever since I have been haunted by the thought that I did not half do my duty to that family. I should have shown that father the dangers of underground drainage, just how and why such water was poisonous, and that death would as certainly be the result of drinking this as any other poison. How many similar pestilential wells there still are in the State, visiting pastors ought to know and denounce accordingly.

Thank God, the ministers are waking up to this subject in good earnest, not merely such Prime ministers as Beaconsfield and Gladstone, who teach that the health of the people is the first duty of the statesman, but other ministers of various denominations who preach the same. Sidney Smith, Robertson, Arnold, and Charles Kingsley, in England, have been followed in the United States by the late Dr. Bellows, by Bishop Voland of Minnesota, Bishop Gillespie of Michigan, and by leading Congregational, Methodist, and Presbyterian ministers, not a few, all over the land. December, a year ago, I was in New York, and attended the Saturday evening meeting of X. A., the oldest ministerial club in the city. Dr. Taylor was there, Dr. John Hall, Professor Schaff, Professor Hitchcock, and thirty others, many of whom it would be hard to duplicate. On calling the meeting to order, the announcement was made that Dr. W. was lying at the point of death—that his disease was blood poisoning, and there was no hope for him,—that his physician had long suspected that malaria was the source of his failing health, but after repeated examination of his house, they had not been able to discover where the malaria had its origin. Alas, one fatal spot they had not examined. Dr. W. had a beautiful library—many of the volumes left by an illustrious predecessor, and for which a fine back building had been erected. That room as his intellectual workshop was Dr. W.'s pride and joy. Little did he dream that with every breath he inhaled, that fatal poison (for which as yet there seems to be no effective antidote) was spreading through his veins—but so it was. Only a few feet beneath his desk was the junction of two ancient and long forgotten drains! from which there was a large escape of the most deadly form of sewer-gas all the time! Seldom have I witnessed so great a sensation as in that venerable circle. Other cases of blood poisoning were mentioned, especially that of a well known statesman (Hon. Walter Phelps), poisoned at

Washington two years since, and now abroad to see what can be done for him, but thus far without any hope of success. For reasons of delicacy as a general thing names were withheld, but the cases fully given on competent testimony. Dr. W. died, but at the next meeting the best sanitary expert in New York was invited to address the meeting, with what result for record I do not know, as greatly to my regret I was obliged to leave the city and did not have the pleasure of hearing him.

So much for the experience of one minister, and now for its practical application in the form of suggestions, leaving to a special committee, if the convention see proper to appoint one, to return to those ministers such of these suggestions as they choose in the form of recommendatory resolutions:—

1. The duties of ministers to the sick and dying whatever the form of disease, are as well known and universally recognized as any law in the physician's code of ethics, and need not here be given in detail. Men believe in fearless care of the sick, and in the sympathy for the dying that expresses itself in proper attendance.

It is indeed not very pleasant of a July afternoon to see a gentleman when he has the confluent small-pox, and offers to shake hands with you, but you need not shake hands! It is not altogether the most agreeable thing in the world, when a man who is hiccupping, and shaking convulsively from head to foot with diphtheria, desires a kiss, as Lord Nelson when dying desired of Hardy, but you can give your cheek instead of your mouth. "While ministers should never shirk from duty because of an unwonted fear of contagion, they should study times and seasons and opportunities." Typhoid fever is considered as the great exception (in a person over fifty years of age); why I leave it to the physicians. Dr. John Brown says, "he never would allow his father to go to typhus cases," but the only case of real typhus I ever saw I attended until the poor patient shed her old skin or crust like a snake, and no harm came of it.

2. While a minister visits his parishioners during an epidemic just as the physician does his patients, he should subject himself to the same laws of disinfection as the physician, lest he should carry the germs of disease in his clothing and so spread the epidemic.

Simply because "Iwas not afraid," I have not only been very foolhardy in this respect, but as I now see it in the retrospect very culpable, and at times may have done more harm than good.

3. If the lips of the priest should keep knowledge, and for the soul to be without knowledge is not good, neither is ignorance good for the body. The minister should not keep that knowledge to himself but increase and impart it to others. "He need not go as far as Mohammed, and say that the practice of religion is founded on cleanliness, which is the key of prayer and one-half the faith;" but he can at least say with John Wesley, "that cleanliness is next to Godliness," and thereby show himself an equally sound sanitarian. If as a scholar he deems it essential that he should understand the five great points of controversial theology, let him in visiting the homes of his parishioners be equally well posted in the five cardinal points of sanitation—drainage, house-isolation, gas-tight and water-tight piping, ventilation, and how to secure clean water—about which last points there certainly will be much less controversy. While there certainly is a sense in which the finger of God is as visibly present in modern pestilence as in the plagues of ancient Egypt, yet this is a very different thing from what Rev. Samuel Haughton denounces as the will of God theory of disease.

All truths go in doubles, says Bishop Butler and the Apocrypha. To every truth there is a divine and a human side. Carry the divine side out beyond its proper limits and it becomes fatalism. Carry the human side out to the same unwarrantable extent and it becomes naturalism, materialism, or atheism—call it what you will. To hold the single truth in either case it is not necessary to throw away the equally important counterpart. As there are *fines intra quos*, so there are *fines extra quos*, in which says the poet—*ne consistere rectum*. Like the rafters of a house they meet and mutually support and strengthen each other. Other things beside man and wife God has put together; let not man put them asunder. Otherwise it will be found that a half truth is one of the most dangerous of lies.

4. If, as I find it in Ziemssen's Cyclopædia, follicular pharyngitis (or sore throat), is due partly to the rapid evaporation from the mucous surface, while the air passes over it when the mouth is open, and partly to actual mechanical irritation by the air current, if the vocal chords are sometimes implicated and become congested, and occasionally there is even paralysis, and resulting aphonia, and all this largely from impure atmosphere,—the minister owes it as a duty to himself to have pure air as well as pure gospel. When Spurgeon was to preach not long since in a church where he saw there was no other or better mode of ventilation, he imitated the example of David. Taking five or more smooth stones from a neighboring brook in the dusk of Saturday evening he broke as many panes of glass as he deemed requisite. The sacrilege of course was attributed to mischievous boys or ungodly men, until Monday morning, when the great preacher confessed he was the criminal, and footed the bill himself!

5. If it be a self-evident proposition that opera houses and halls should be thoroughly and systematically ventilated, *i. e.*, substitute pure air for impure, is it not equally necessary for churches? Whenever I see the ladies faces looking as if they were about to faint, and some of the good elders or deacons nodding frequent assents to the speaker, and some beyond the help of snuff, or pinches, or sal volatile to keep them awake, I do not feel that the trouble is altogether in the preacher or in Mr. Eutychus.

A short time since I was in a church where the whole air is changed every five or ten minutes. What a luxury it was to breathe,—what a pleasure to listen to the sermon! The next Sabbath I was elsewhere. In the morning the air was good; after service the basement was filled with the Sunday School; the air of the basement went into the audience chamber above, and the windows remaining closed, you can imagine the condition of the atmosphere in the evening. Some sanitarians have gone so far as to affirm that good air in a church will double a minister's influence in preaching. I will at least admit that they will double the attention of their hearers. True, ventilation costs something; to build a chimney like a shot-tower, to run a powerful engine, and keep it running all the time of service,—but Dr. Hall's hearers think it pays. And so will proper ventilation always pay, though the means of obtaining it may be much more cheap and simple.

There is another thing in which preacher and hearer have a common interest. Never are we so liable to catch cold as when just leaving a vitiated atmosphere. One Friday night in Galesburg, Illinois, the air was so hot and close and oppressive that I brought the meeting to a speedy close. Scarcely had we left the house when two of us were so affected with tightness or shortness of breath that it was with difficulty we reached home. Sunday I did not preach.

I had enough to do to breathe. Wednesday I was able to get out to see my friend. To my surprise I found him dying, neither himself nor his wife up to that time supposing there was any danger. At once I went for the physician, but it was too late. The people said it was a sad providence—the doctor said he died of typhoid pneumonia. I say that my friend Bancroft died of bad air!

6. And this brings me to another point, viz., the duty of ministers at the funerals of those who have died of some contagious or infectious disease. Dr. Baker in his paper reprinted from the sixth volume of the Transactions of the American Public Health Association, Boston, 1881, gives four suggestions unto which ministers would do well to take heed:—

1. "The body of a person who has died of diphtheria should as early as practicable, be placed in a coffin with strong disinfectants, and the coffin should then be tightly closed and exposed to strong fumes of burning sulphur. Afterwards the body should not be exposed to view except through glass.

2. "No public funeral should be held at a house in which there is a case nor in which a death from diphtheria has recently occurred.

3. "No child should attend the funeral of a person who has died from diphtheria.

4. "Except under extraordinary precautions there should be no public funeral of a person who has died from diphtheria."

Those who have had the sore throat and the terrible sense of poisoning that sometimes accompanied their exposure to this disease, I think will fully concur in Dr. Baker's opinion.

In the same essay I notice another suggestion, which ministers may well consider also:—

"All persons recovering from diphtheria should be considered dangerous to society, and therefore no such person should be permitted to associate with others or to attend school (Sabbath school I suppose as well as week-day school), church, or any public assembly. Certainly not until the throat is healed, as also any sores which may have been on the lips or nose; and not until after the patient has had a thorough bath and thorough disinfection, and an entire change of clothing, and not until in the judgment of a careful and intelligent health officer he can do so without endangering others."

Some of these suggestions seem hard, but did time permit I think it would be easy to show that they are alike in accordance with the letter of the old Testament and the spirit of the new, with the example of Moses, and that of our Lord himself. Nothing, did time permit, would be easier than to translate the laws against leprosy, the house with leprosy in the wall, the paddle in the camp, the searching the cellars for leaven, with lighted candles, into sanitary technology.

But to conclude a paper which has grown on my hands far beyond your patience I fear, and certainly beyond my original intentions.

"What we need," says one of the most ably edited and undenominational religious newspapers in the country (The Independent, Feb. 9, 1882), "and what we wish is more earnest sanitarians among the clergy—men who, like Canon Kingsley, will feel called upon to aid in the prevention of disease, and by timely visits and good advice help to secure the sanitary conditions of premises and householders, and deliverance from these maladies which too often spread and prove fatal by neglect."

This is a wish in which I am sure all this convention will most heartily join. No doubt there are philosophers not a few, who, like Herbert Spencer, will

continue to denounce all boards of health as impediments to sanitary progress, and all who sympathize with them as "creation menders" and "spurious philanthropists," etc.; but philosophers have been mistaken, and may mistake again. They may be lovers of wisdom, and yet not get her after all. No doubt there is many a man like that precious old idiot of most unenviable fame, Alderman Lawrence of London, who in his place in Guild Hall, made himself the laughing stock of the whole nation by declaring that drainage was of no account, that sewer-gas was a humbug, that water that went through graveyards was as good and sweet to him as any other water, and all this sanitary business was "got up," sir, yes, "got up in the interests of builders and plumbers, and sich"! But Alderman Lawrences always have been in the world, and will be in common councils, and other high places of power, so long as there is any room in the graveyard for one more to, bury them.

No doubt there is many a woman, like the Cottage Wife, who held the "Will of God" theory, and who is so keenly satirized by Tennyson in his recent ballad of The Taiile:—

> "But Nellie, the last of the cletch, I loiked her the first of them all—
> For, hoftens we taalked, of my daughter as dead, o' the fever, at fall—
> An' thowt t'were the will of the Lord! but Miss Annie she said t'were drains,
> For she had'nt naw comfort in her, and airnt naw thanks for her pains."

But no doubt, also, in spite of Philosopher Spencer, and Honorable Alderman Lawrence of Guild Hall, and the redoubtable seller of butter and eggs to the "Squoire," thanks or no thanks for our pains, the sanitary cause is a healthy cause, and will triumph in the end. GEORGE DUFFIELD.

Lansing, Michigan, Feb. 25, 1882.

The convention then adjourned until 2:30 in the afternoon.

FOURTH SESSION, WEDNESDAY AFTERNOON, MARCH 1, AT 2:30.

The convention was called to order by vice-president Judge W. D. Harriman, and Dr. W. F. Breakey read the following paper:—

UNSANITARY METHODS AND RESULTS OF SCHOOL WORK.

BY W. F. BREAKEY, M. D., OF ANN ARBOR.

Having been requested by the committee of arrangements to present some opinions from the standpoint of the physician on some of the unsanitary methods and results of school work, I approach the subject with some timidity, chiefly because of the suspicion with which even a discussion of established affairs is viewed, and particularly because of the fear that a discussion of the school system may lead to unhealthy disturbance of it. To venture the opinion, however, at the educational center of a great State, whose schools are its pride and glory, that its public schools are not doing all the good they might, savors more perhaps of temerity than timidity.

Boards of education and teachers so often receive advice from that large class of philanthropists who can tell any one else how to "keep" a hotel, "run," a newspaper, or manage a school,—it is true they rarely do these things successfully themselves, but they know the right way,—that it is not strange, therefore, that school authorities look with distrust upon opinions that question the success of the schools.

It is not necessary to waste time in demonstrating self-evident propositions. It will be conceded that the school with all its belongings is the servant of the people, and that to just the extent that it serves the people well or ill, will it

have the confidence and support of the public. Whoever can show the school how it can render better service, befriends both school and public.

The public school is but an aggregation of family schools, a sort of coöperative plan to teach our children. If a majority of the patrons should withdraw, the public school would soon go down. The public school costs enough to deserve the support of the public, and it should be so good as to obviate the need of private schools. It is doubtless because the public school does not serve the purpose of the family school satisfactorily to all, that some who pay taxes to support it, still send their children to private schools.

It is a legitimate province of sanitary science to investigate the opinion, so frequently heard of late, that in its relations to public health, the public-school system is less deserving of public confidence, and if this opinion is not well founded, to contradict it by an exposition of facts. If it is in any sense true, it is equally important to discover whether it be due to preventable causes, and to suggest remedies.

The sanitary questions involved in poor architecture, imperfect heating and lighting, uncomfortable seats, defective ventilation, crowded rooms, climbing stairs, unclean out-buildings and yards, impure drinking-water, etc., all so patent as to be obvious to intelligent observers, are yet far too little understood by the public at large, and too little practiced in dwellings as well as in school-buildings. Yet as a result of sanitary work, they are now everywhere engaging public and official attention. In our own city within a year several instances of this kind were discovered in a sanitary inspection of school buildings, and made the basis of a report to our school board, and with commendable energy the school authorities corrected the evils pointed out. Ventilation will be ably considered in special papers on that subject, to be read at this meeting. For these reasons and lack of time I do not directly take up these more prominent unsanitary conditions of school buildings and premises. My purpose is briefly to consider some of the questions as they appear to the sanitarian, of the immediate as well as remote effects on health, of school life and school work. In doing this it should be our aim to discover facts, to consider conditions, and, as far as possible, causes. The question of responsibility will naturally adjust itself. I fear we shall all come in for a share. It is not so important that we try to find somebody to blame, as it is to find errors if there are any and correct them. Schools and teachers are what society and the age make them. They cannot well rise above the estimate and support of their patrons, and probably as a rule reflect the civilization and intelligence of their localities. We expect too much from schools and books. Parents put too much of their own work and responsibility on the teachers. The highest high-school is the home. I fear that too much of the failure of school work is unjustly charged to teachers. Teachers are but the agents of School Boards, and feel themselves but part of a system, answerable to the authority from which they hold their appointment, and not free to vary from a plan of management or curriculum of study; and as they say, are more often urged by ambitious but misguided parents to push their children ahead than to hold them back. This being true, public opinion will enlighten parents. Although my aim was to consider the hygiene of school-life chiefly from the physician's point, yet I think it has too many sides to be fairly considered from only one standpoint.

Therefore, believing that the opinions of a considerable number of prominent physicians, teachers, and superintendents in the State would give much

broader views from a variety of stand-points, and more force because representing a great variety of observations, experience and opinions, I requested to have addressed the following circular of inquiries to about 100 each of superintendents, teachers, and educators, and prominent physicians in the State and country.

The questions, though hastily prepared, were designed to cover sufficient ground for a fair consideration and discussion of the subject, and I believe the opinions will be found of much value. I wish here to take this opportunity, as I cannot well write each one, to thank the very large number who so promptly responded to the inquiries.

ANN ARBOR, MICH., February 14, 1882.

DEAR SIR:—Having been requested to present a paper on School Hygiene before the Sanitary Convention at Ann Arbor on Feb. 28, I am very desirous to get opinions from physicians and others interested in, and with practical knowledge of, the whole subject, particularly on the following points.

A prompt answer is desired, as the information must be received before the 25th inst., to be available.

1. In your opinion is the work required of scholars in the graded schools, with which you are acquainted, too much either in number or character of studies for the average age of those attending the public schools?

2. If so, what ill effects have you observed?

3. Is the risk of injury greater to girls or to boys?

4. Have you knowledge of cases of serious, protracted, or fatal illness fairly attributable to overwork in schools?

5. Is the discipline of schools too exacting in its requirements of attendance?

6. Should absence properly accounted for appear, in any system of marking, to the discredit of the scholar?

7. Is there tendency to over-stimulation of nervous system, and disproportionate development?

8. Within your observation have the precocious scholars after leaving school maintained the lead in practical life?

9. Have those who have broken down in health been good or poor scholars?

10. Can the courses of study be made more elective, and the rigidity of class work and the exacting system of marked examinations be relaxed, or made more elastic, without loss in efficiency?

11. Is undue prominence given to studies overtaxing the memory or the analytical powers of children, e. g., the details of history, and advanced mathematics?

12. Are specialists or experts in any department of learning fair judges of the difficulty with which children of different ages, temperaments, tastes, and abilities, can acquire that special kind of knowledge?

13. Is a continuous session of five hours, from eight o'clock to one, preferable to a forenoon and afternoon session?

14. Would you advise more attention to the study and practice of physiology and hygiene in the public schools?

Any additional suggestions pertinent will be gladly received.

Respectfully,

W. F. BREAKEY.

A summary of the replies to the circular received follows: It is made to include both classes of respondents in one summary, the replies by superintendents of schools only in another, and the replies by physicians in a third. The numbers refer to the numbers of the questions in the circular, and correspond with them.

SUMMARY OF THE REPLIES FROM SUPERINTENDENTS AND PHYSICIANS.

1. Total number of replies, 78. Yes was the reply of 38; no, of 36; possibly, 1; sometimes, 2; don't know, 1.

2.* Total number of replies, 33. Nervousness, 24; laziness, 1; general injured health, 4; headache, 2; discouragement, 1; dislike for study, 1.

3. Total number of replies, 66. Girls 49; girls after 12, 2; equal 14; neither, 1; don't know, 1.

4. Total number of replies 71. Yes, 32; no, 32; few, 5; one case, 1; two cases, 1.

5. Total number of replies, 73. Yes, 27; no, 42; perhaps, 1; for girls, 1; in some places, 2.

* There were other unimportant answers.

6. Total number of replies, 76. No, 66; yes, 5; yes and no, 1; unless on account of sickness, 1; conditionally, yes, 2; sometimes, 1.
7. Total number of replies, 69. Yes, 39; no, 20; perhaps, 8; generally, 1; don't know, 1.
8. Total number of replies, 71. No, 59; yes, 6; usually, 2; precocious scholars too rare to judge, 2; uncertain, 1; don't know, 1.
9. Total number of replies, 63. Good, 43; poor, 10; equal, 8; don't know, 2.
10. Total number of replies, 72. Yes, 42; no, 15; doubtful, 3; perhaps, 4; don't know, 6; yes and no, 1; in regard to examinations, 1.
11. Total number of replies, 74. No, 30; yes, 36; uncertain, 3; don't know, 5.
12. Total number of replies, 70. No, 63; rarely, 2; yes, 5.
13. Total number of replies, 67. No, 56; yes, 8; for city schools, 1; don't know, 1; doubtful, 1.
14. Total number of replies, 63. Yes, 54; no, 5; with good teachers, 2; perhaps, 2.

SUMMARY OF 34 REPLIES FROM SUPERINTENDENTS OF SCHOOLS.

1. Total number of replies, 34; Sometimes, 1; yes, 10; no, 22; don't know, 1.
2. Total number of replies, 14. Nervousness, 9; laziness, 1; dislike for study, 1; general injured health, 2; discouragement, 1.
3. Total number of replies, 29. Girls, 20; equal, 8; don't know, 1.
4. Total number of replies, 37. Yes, 7; no, 27; few, 3.
5. Total number of replies, 28. Yes, 2; no, 23; for girls, 1; some places, 2.
6. Total number of replies, 32. No, 27; yes, 3; yes and no, 1; unless on account of sickness, 1.
7. Total number of replies, 30. No, 15; yes, 7; perhaps, 7; generally, 1.
8. Total number of replies, 29. No, 20; yes, 4; usually, 2; precocious scholars too rare to judge, 2; uncertain, 1.
9. Total number of replies, 17. Good, 5; poor, 6; both, 5; don't know, 1.
10. Total number of replies, 29. Yes, 15; no, 8; perhaps, 3; doubtful, 1; yes and no, 1; don't know, 1.
11. Total number of replies, 36. No, 24; yes, 9; uncertain, 1; don't know, 2.
12. Total number of replies, 29. No, 24; yes, 4; rarely, 1.
13. Total number of replies, 30. No, 22; yes, 7; doubtful, 1.
14. Total number of replies, 22. Yes, 18; no, 2; perhaps, 1; with good teachers, 1.

SUMMARY OF 58 REPLIES FROM PHYSICIANS.

1. Total number of replies, 44. Sometimes, 1; yes, 28; no, 14; possibly, 1.
2.* Total number of replies, 24. Nervousness, 15; headache, 2; general impaired health, 2; incompetency, 1; decrease of physical power, 1; too early physical development, 2; lack of thoroughness, 1.
3. Total number of replies, 38. Girls over 12, 2; girls, 29; equal to sex, 6; neither, 1.
4. Total number of replies, 42. Yes, 25; few, 2; no, 15.
5. Total number of replies, 43. Yes, 25; no, 17; perhaps, 1.
6. Total number of replies, 44. No, 39; yes, 2; conditionally yes, 2; sometimes, 1.
7. Total number of replies, 41. Yes, 32; no, 5; don't know, 1; perhaps, 1; sometimes, 2.
8. Total number of replies, 43. No, 39; yes, 2; as often as they do not, 2.
9. Total number of replies, 46. Good, 38; poor, 4; both, 3; don't know, 1.
10. Total number of replies 40. Yes, 27; no, 7; don't know, 3; perhaps, 1; doubtful, 2.
11. Total number of replies, 39. Yes, 28; no, 6; don't know, 3; uncertain, 2.
12. Total number of replies 39, all no.
13. Total number of replies, 37. No, 34; yes, 1; if for high school, 1; don't know, 1.
14. Total number of replies, 41. Yes, 36; no, 3; with good teaching, 1; perhaps, 1.

I have long held the opinion that the graded schools of our State attempt too much work, both in number and character of studies. The conscientious scholar tries to compass the requirements, and if exceptionally vigorous and bright may succeed,—if not, failing, gives it up discouraged, thinking the fault in himself, or persisting under difficulty, overworks out of school hours as well as in school, sleeps too little, impairs digestion, and brings on a train of nervous disorders which further unfit him for work, yet which pride keeps him from confessing; unable to do so much thoroughly, he studies for examinations—studies rules of text-books rather than principles—studies and forgets, to make room for more. The not conscientious scholar makes no pretense of honest work and studies only for "marks." While the slow and dull scholar, fortunately for himself, is put back, or unable to keep up, if he has some

* There are other differing but unimportant answers.

brains and good bodily health, we find later in life surprisingly often coming to the front with a vigor and staying qualities, astonishing to his more precocious school companions. This cannot be a fair illustration of the survival of the fittest.

It must be disappointing to teachers to know how much of their painstaking teaching is forgotten, and how soon it is forgotten—not because the work or the scholars are exceptionally poor—but because there is a limit to the receptive capacity and retentive powers of mind, as there is to the capacity of the digestive organs. We can see the limit to the grinding capacity of a mill with its hopper full, or even of a sponge full to saturation. It is significant that the large majority of physicians, who have the best opportunities for observation, and no motive for deceiving themselves or others, believe that the average schools require too much work. So do a large number of teachers, and all alike, parents, business men, and scholars, as they grow older, put a higher estimate on health as compared with school work, advising less in number and amount of studies or more time to accomplish it.

The chief business of early childhood is to eat, digest, and sleep, to make tissue, develop bone and brain, and muscle and morals—in short *to grow*. To make growth symmetrical all the tissues and functions should develop harmoniously. Dr. Wm. Pepper, Provost of the University of Pennsylvania, in a recent paper "When Shall a Child Begin School?" advises no fixed age, but when he can bear the confinement and mental effort. He says: "Few appreciate the strain that even two or three hours attendance daily and the effort to master two or three simple little lessons exert on the sensitive organization of young children. Their brain and nerves are exquisitely delicate, and it is a period of such rapid growth that the power of nutrition is taxed in supplying material for the formation of perfect tissue."

Dr. Benjamin Ward Richardson, one of the most eminent scientists of England, in an address before the Brighton Health Congress, on the "Seed-time of Health," says:—

"These evils, inflicted on childhood in its first estate are, moreover, followed later on by other evils not less reprehensible, and by one worse than all. I mean the evil of endeavoring, during the time when all the nervous force the growing frame demands is barely sufficient to sustain the natural wants of nutrition, to tax that growing frame beyond the powers that belong to maturity, with competitive mental and physical labors.

"Both good in their way in moderate form, both necessary for health in moderate form, mental and physical labors are in these days made the bane of the nation—the false and useless efforts which crumple up the animal and spiritual natures, making distaste for labor an early disease, and blighting every flower of genius as soon as it begins to bud, is equal in falsity only with the conviction it engenders, that men are made but to learn up to the time of maturity, and that an education which is not what is called 'finished' when school or college is left behind, is an education that can never be made up in after life.

"I know nothing so deadly to mind and body as this anxiety now all but national in its acceptance, to complete education within twenty-one years, when the fact really is that length of life, and length of happy life depend on the continual cultivation of mental and physical existence beyond all else."

Prof. Jewell of Chicago, in a lecture on "Our Present Civilization in the Production of Nervous and Mental Diseases," says:

As is seen by the workings of our public school system in this country, especially in the Northern States, the graded system in our schools represents essentially the average of practicable attainment within stated periods as fixed by experience; many could easily rise above a grade in the allotted period; still others, with rather close application, can maintain themselves at the level of their grades; while a very considerable number reach the required level only by systematically overdoing; while a few others finally break down in nerve health by the way, and are hence obliged to abandon their course of study. It is my opinion that a very great number of cases of nerve disease are produced, such as cerebral congestions, undue nerve irritability, sleeplessness, or, at least, imper-

fect sleep troubled by dreams, headache, various forms of neurasthenia, not to speak of graver forms of disorder, by systematically overtaxing children in our public schools. This opinion is the result of very considerable observation and experience. It is not uncommon for children, either of their own notion, or as compelled by their parents or guardians, to study evenings until the brain becomes excited, its circulation disturbed, and the result very frequently is restless and unrefreshing sleep, headache, and, sooner or later, more or less marked exhaustion or nervousness, in various degrees and ways. Statements of the same tenor might be multiplied, and are susceptible of practical demonstration. Within fifty or one hundred years whole sciences have been created. Knowledge has been extended in a surprising manner in almost all directions, and courses of study are now, as a rule, very much longer, embrace a greater variety of subjects than was true in earlier times, and the mind of the student is taxed as never before. In hundreds of instances have I seen, during the later periods of student life in our higher schools, general nervous exhaustion, brain exhaustion, melancholia, hysteria, vascular irregularities, cerebral congestions, headaches, insomnias, neuralgias, tremors, and the like, the direct results of overstudy.

The very able papers of Prof. Sill, Supt. of Public Schools of Detroit, and of Prof. E. A. Strong, of Grand Rapids High School, read before the sanitary conventions in Detroit and Grand Rapids, are worthy of all commendation and show the tendency of best thought among teachers. They are both so wise and temperate that I cannot forbear some quotations at the risk of doing injustice by presenting a few sentences.

Prof. Strong, in touching upon the possible tendency of the race to physical degeneracy from over-cultivation, says:

"It is not wise to answer this question as is usually done by pointing with a laugh to the common-place, unanxious school-boy, who knows nothing except on compulsion, and asking if he is likely to die of over-cultivation! * * *

"Let us go on some bright afternoon through the rooms of any school-house in the land and see the flushed faces mostly either too eager in aspect or too gloomy, bending over books, or resting wearily on the hand, and can we feel that this is the right place for these young people?

"This is a great and grave question, and one it seems to me which is not to be put to rest until a considerable modification of present school habits and methods has been secured. But while we are thinking of the evils of restraint and over-cultivation, we ought not to forget the evils of license and unrestrained obedience to impulse. * * *

"My own thought and experience lead me to believe—and let me say it with some emphasis—that the evils of school life are casual and accidental, rather than essential and necessary, and that under easily obtainable conditions, attendance at school should be favorable to health and longevity. Hence the problems of school hygiene if difficult are not hopeless."

I cannot better answer the question as to attendance than in the language of one of the foremost teachers in the State. Prof. Sill asks:—

"Is there not danger to the health of pupils in the vigor of the effort sometimes made by school authorities to secure high per cents of attendance? Taking into account the variety of diseases to which children are liable, the violent changes which are characteristic of the climate in this latitude, the large number of stormy and inclement days that fall to us during a portion of the year, and adding to these the various other causes of irregularity in attendance which must and do exist in every community, I am of the opinion that the exactions of the schools in this respect are sometimes excessive and hurtful to the health of pupils. * * * It is quite possible to have too much of a good thing, to lay such stress and emphasis upon constant attendance, to so visit delinquencies in this respect with direct or indirect punishment, and to so excite emulation and rivalry between pupils and between different schools, that children will be at school when they ought by all means to be at home. A few of the better and more ambitious pupils need restraint rather than urging in this respect, and girls especially who are on the whole more generally faithful than boys to school duties, spurred on by pride in a perfect attendance-record, and by hope of approbation or a fear of reproof by their teachers, will often overbear the counsels of a prudent mother, who knows better than they can know that there are times when over-exertion and exposure are dangerous and may imperil health, happiness, and usefulness for a lifetime. In view of these facts it seems well that school officers and employers of teachers should, for a time at least, cease to make too much of the per cent of attendance. Teachers should be allowed to feel that there is something else worth working for, and that their temporal salvation does not too largely depend upon it. * * * It is important to the health of children attending our schools that they be happy and contented in their work. Whatever depresses and unnecessarily restrains the natural buoyancy of spirit is injurious and in the end dangerous. The body cannot long remain healthful if it be the dwelling place of a perturbed, irritated, and unrestful spirit. A child

constantly repressed and annoyed, thwarted in all impulses of childhood, in chronic rebellion against an unnatural and unwise discipline, not founded on sense or justice, but prevailing to some extent even at the present day in the schools, not only grows petulant and irascible, but through the deep sympathy that exists between mind and body suffers physically as well. * * * There is another danger, that of over-work and over-anxiety to the small minority of pupils who are exceptionally ambitious and conscientious in the performance of their duty, and the peril to such is greatly increased when to these characteristics is added extraordinary sensitiveness to the approbation or displeasure of the teacher. * * * They need kind and constant restraint as to the amount of work which they incline to do. Even approaches to failure in the school work should be overlooked and the keen mortification which is sure to follow should be modified and made easy to bear. Such pupils are usually fragile in physique, and harsh or unskillful handling may easily break them down or unsettle the fine balances of the nervous system and make impossible of fulfillment the glorious promises of childhood."

If there is any class of "public functionaries" who render full measure as to quantity it is the teacher, some of whom put in six hours a day—and some of the holidays—in school, and any number of hours nights and Saturdays marking rolls.

The *esprit du corps* is high. Like Goldsmith's village schoolmaster,

"Yet he was kind, or if severe in aught,
The love he bore to learning was in fault."

It is not unnatural that he should relatively overrate the value of his work. We are all too apt to think the world would not go on long without us. Even doctors exalt their calling, yet many people live, and a few die without their help. The shoemaker at the meeting of his townsmen to consider means of defense against threatened invasion said "there is nothing like leather." Seriously, the value of the true teacher and his work cannot well be overrated.

The discipline of our schools is commendably successful—as discipline. Whether all its requirements are wise is a fair question to consider. A large number of people, and many teachers, are coming to think that in many essential points it can be materially relaxed without loss to classes, and with gain to individual scholars; that its obligations on the scholar can be satisfied without being put above the obligations due to the family and the home. The enthusiastic zeal to make records of brilliant scholarship is well, if we keep in mind that this is only one of many schools—all having claims, some as strong, and contributing as important share to an education as any procured in buildings devoted to teaching from books—schools of the shop, the kitchen, the garden, the farm,—schools taught by circumstances, necessity, poverty, duty, affection, and that very large school said to be so "dear," taught by experience. If we remember also that it is but "school" after all, that "life lies beyond"—that failures to come up to some arbitrary standard in school are not necessarily or always failures in life, there are still opportunities to "make up."

Prof. Sill says, "something more than knowledge is required to make an efficient teacher." If this is true of those who are to teach others, how much more true is it, in all other walks of practical life, and inferentially true, that "knowledge," such as is only in schools, may be over-rated in value.

I do not believe there is a school board in Michigan, or one in twenty of our business men who can without preparation pass the examination required to promote from the grammar school to the high school, and it is doubtful if they could enter the grammar school and be limited to the particular rules and text-books.

The scholar is led to think too much depends on answering questions according to a particular author or text-book, and becomes too dependent on books and formulas, tending to discourage originality of method.

How humiliating it will be for the authors and teachers of this decade to learn ten or twenty years hence that many of the text-books now considered so necessary have become displaced by others.

If the five hour session does not allow or require over three continuous hours' work of any one teacher or scholar, then it may have some advantages for the high school; and it is undoubtedly convenient for the teachers. Rooms continuously used should be vacated between recitations, and thorough change of air secured, unless this is accomplished by ventilation. Grading classes of scholars of different ages, capacities, and temperaments, presents one of the most difficult problems to deal with, and one which mere fault-finding will not remove, as it inheres in the system, and in all classwork in or out of school. It would be unjust to suppose that teachers do not apprehend it, and do not do the best with the means at hand for its solution. Smaller classes must be the first step.

Of course no teacher can make up for natural defects—neglect—bad home influence.

President Eliot of Harvard University, in speaking of elective studies in American colleges, says:

"The average student, with the help of his instructors and friends, makes for himself a selection of studies which is more judicious than the college faculty could make for him with such knowledge as they are likely to have of his tastes, capacities, and purposes,—a much better selection moreover than any prescribed curriculum would be."

Within proper limits, why is not the same principle applicable to all schools?

And just here we notice a point which if not sanitary might be salutary to consider—though it would be manifestly out of place to enlarge upon. Physicians see nearer views of domestic life and economy than most persons—of sickness, privation, self-denial, and the most pinching care, the most heroic devotion in parents. To shelter, feed, and clothe a family of children often taxes to the utmost the ability of many parents even if all keep well. With sickness the difficulties increase—every penny has to be considered. Ten cents is more to them than ten dollars to the book publishers, and every unnecessary pencil, pen, blank paper, or book required is so much of a discouragement to such scholars, and more often than school authorities know, is responsible for temporary absence and final abandonment of school by many who most need it, and often turn it to best account; while to those to whom the cost is of small moment, the child, aside from incurring expensive habits, is too dependent—like the one with ready-made toys, has no "necessity" to be "mother to invention," and does not invent ways and means to meet the case, but makes a requisition at home for more books and blanks. Teachers say they cannot make bricks without straw—though so much paper is made of it—but neither can good bricks be made with too much straw. Why not accept the work if it be good, if it be written on wrapping paper, if the scholar has no better. The only requirement should be the knowledge,—no matter from what books or how it is acquired.

I believe the money unnecessarily spent for books, blanks, etc., added to the present inadequate salaries of teachers, would command better service, enable many who now pursue teaching as a temporary avocation to better fit themselves for a more permanent work in a calling than which there is none higher. I venture the opinion that a teacher of the kind that Prof. Sill says "is born, not made," can teach the elements of arithmetic to children of a proper age to learn it, without any book whatever, quicker and better than the teacher who relies on books and rules only; and teach it so that the

learner will understand it in any book. Text-books in geography and maps may need occasional changes to keep up with discoveries and new boundaries. Grammar ditto in a less degree. Let us have less "machine teaching" and more consideration of individual scholars. Pay teachers for better work and require it—not in complicated and laborious systems of marking—not in standing guard over so large a number that none can be taught—not in cramming something of a great many studies—not in managing the whole system with reference to the few who go to higher schools,—but to teach a reasonable number whom the teacher can become acquainted with individually, such general principles that whether they go higher in school or not after leaving it, they have something to build on,—a system which shall give the greatest good to the greatest number. The remedy for much of the evil must be as in all sanitary treatment better education of parents and all school authorities. Educate the educators in the art of conserving health and making life longer, happier, and more useful. If there is fault in the system let us see whether it is as Dr. Richardson says of "the perils that beset the spring-tide of life," "inherited," "accidental," "inflicted," or "acquired," and whether it is curable.

Finally, if we have to stop with some things untaught in the school, let us comfort ourselves with the reflection that there is much that the best of us do not know, and leave a little for the children to learn when they grow up—not a plea for ignorance but for health, not so much for less work as more time in which to to do it. Let us feel thankful if we can keep our children with us healthy and learned also if possible—but healthy anyway, during the period of life which comes nearest to happiness and contains most joys.

SUMMARY.

As a summary of salient points enforced in this paper, and in the answers to inquiries, besides answers arranged in numerical summary, may be mentioned—

Do not let children attend school at too young an age.

If any class is to have better teachers than any other it should be the youngest scholars.

Short sessions for the young.

Less work in school, or more time. More elasticity for those who cannot or do not want to take all of any course.

Frequent recesses. Observe all legal holidays.

More air-space per scholar. Better ventilation, heating, and lighting.

Less climbing stairs for very young children and girls of the older school age.

Requiring teachers at least to pass satisfactory examinations in physiology and hygiene.

More consideration of scholars as individuals whose mental capacities differ as do their temperaments, tastes, and physical structure.

REPLIES TO THE CIRCULAR.

Replies to the circular were received from the following:

SUPERINTENDENTS OF SCHOOLS.

E. M. Stephenson, Cassopolis.
U. W. Lawton, Jackson.
H. Q. Butterfield, Olivet.
W. E. Bellows, Allegan.
O. C. Seeley, Owosso.
E. V. W. Brokaw, St. Clair.
N. P. Collins, Homer.
Horace Philips, Grand Haven.
Frank Landon, Niles.
G. P. Glenn, Marshall.
Miss M. L. Jones, Charlotte.
Webster Cook, Manistee.
D. Putnam, Ypsilanti.
W. S. Perry, Ann Arbor.

J. A. Stewart, Monroe.
C. B. Thomas, Saginaw City.
C. G. Kingman, Corunna.
Z. C. Spencer, Battle Creek.
J. C. Jones, East Saginaw.
A. J. Daniels, Grand Rapids.
C. W. Hitchcock, Paw Paw.
W. W. Wendell, Hudson.
J. W. Ewing, Ionia.
C. O. Hoyt, Wyandotte.
M. T. Gass, Flint.
H. V. Chute, Ann Arbor.
B. E. Nichols, Ann Arbor.
J. G. Pattengill, Ann Arbor.
H. S. McMaster, Dowagiac.
D. S. Stephens, Adrian.
Miss Myrick, Ann Arbor.
R. E. and C. F. Kerr, Ann Arbor.
V. M. Spaulding, Ann Arbor.
From Jonesville and Saginaw two letters—no names.

Replies to the circular were received from the following:—

PHYSICIANS.

G. E. Ranney, Lansing.
L. S. Stevens, Muir.
E. S. Dunster, Ann Arbor.
J. E. Brown, Detroit.
J. H. Carstens, Detroit.
E. B. Ward, Laingsburg.
W. B. Smith, Ann Arbor.
S. S. French, Battle Creek.
J. C. Willson, Flint.
E. P. Christian, Wyandotte.
J. S. Caulkins, Thornville.
E. N. Palmer, Brooklyn.
J. H. Jerome, Saginaw City.
E. L. Shurley, Detroit.
M. E. Green, Charlotte.
H. B. Landon, Bay City.
W. R. Marsh, Bay City.
C. B. Gilbert, Detroit.
H. C. Wyman, Detroit.
J. H. Kellogg, Battle Creek.
L. C. Woodman, Paw Paw.
J. P. Stoddard, Muskegon.
S. P. Duffield, Detroit.
Morse Stewart, Detroit.
Leartus Connor, Detroit.
John Brady, Grand Rapids.
Foster Pratt, Kalamazoo.
Arthur Hazlewood, Grand Rapids.
Edward Cox, Battle Creek.
O. Marshall, Lansing.
J. Andrews, Paw Paw.
A. F. Whelan, Hillsdale.
R. A. Everett, Hillsdale.
H. F. Ewers, Union City.
M. W. Tomlinson—Battle Creek.
D. W. C. Wade, Holly.
J. R. Thomas, Bay City.
Hugh McColl, Lapeer.
G. W. Topping, De Witt.
George Howell, Macon.
Sam'l Dubois, Unadilla.
Jno. Kapp, Ann Arbor.
Milton Chase, Otsego.
C. S. Tucker, Coldwater.
H. F. Lyster, Detroit.
E. S. Snow, Dearborn.
W. W. Jones, Toledo, Ohio.
Wm. Parmenter, Vermontville.
Wm. Pepper, Philadelphia, Penn.
G. E. Frothingham, Ann Arbor.
E. H. Van Deusen, Kalamazoo.
C. T. Southworth, Monroe.
S. Hartly, Ann Arbor.
Dr. Webb, Ypsilanti.
B. H. Fairchild, Pomona, Cal.
C. George, Ann Arbor.
Also from Prof. W. H. Payne of Ann Arbor.
Mrs. Dr. F. K. Owen, Ypsilanti.
Mrs. Dr. A. F. Kinne, Ypsilanti.

In forwarding the replies, Dr. Breakey wrote the following letter:—

I return you by express the letters received in reply to my circular of questions on school hygiene. At your request that I would prepare them for publication, I have gone over them as carefully as I could in the fragments of time at my disposal, but find it so difficult to give a fair abstract of most of them, that after a few attempts I have given it up and send you the remainder, cutting out irrelevant matter, and recommend the publication of letters as sent.

Though this may take more space than intended and necessarily make some repetition, yet these letters furnish valuable information and opinions from the two sources best able to observe—the one seeing the work as it goes on in school, but with comparatively little further knowledge of the after-lives of their pupils; and the other, trained observers of health and disease, to whom comes sooner or later a knowledge of most of the ills of body and mind that afflict their fellow-creatures,—and both with unquestioned sincerity of motive. I believe these letters, though fragmentary, will have more influence in awakening public attention to the whole subject of school hygiene, than the opinion of any one individual, be it ever so full.

Therefore to relieve you of any embarrassment as to space, if there be not room for both (as I fear there will not be), I suggest the publication of the letters; and while they do not cover all the points of my paper, I will cheerfully forego any pleasure its publication would give to me, if by that means the opinions of so large a number of experienced teachers and physicians representing different sections of the State can be placed within reach of school authorities.

Respectfully yours,

Ann Arbor, Mich., Aug. 15, 1882. W. F. BREAKEY.

REPLY FROM REV. E. M. STEPHENSON, SECRETARY CASS CO. BOARD OF EXAMINERS.

1. *It would not be the case if we could have a better class of primary work done.

3. The high schools are held in the 2d and 3d stories; boys and young men can endure the climbing, but three-quarters of the girls give out before completing the course. So far as study is concerned girls can do as much or more than boys in most branches.

4. Not over-study, but rather to carelessness in dieting and exercising.

5. It is for girls.

6. No.

7. With incompetent teachers, those who know little of hygiene, etc.

8. No.

9. Poor.

10. Yes.

11. Yes, as to mathematics. History may be made easy.

12. No.

13. I prefer forenoon session for one-half of the pupils under 12 years, and afternoon session for the other half, and all day for older pupils.

14. Yes.

REPLY FROM U. W. LAWTON, SUPERINTENDENT OF SCHOOLS, JACKSON, MICH.

1. *No.

3. No difference.

4, 5, 6, 7. No.

8. Generally, but not always.

9. Good scholars, because children of delicate organizations generally have quick perceptions.

10. Contains several questions; to the first two, I say no; to the others, yes.

11. No.

12. Generally not.

13. No.

14. Yes.

Respectfully,

Jackson, Mich. U. W. LAWTON.

REPLY FROM O. C. SEELYE, SUPERINTENDENT OF THE OWOSSO CITY PUBLIC SCHOOLS.

From my short experience I answer your questions as follows:

1. *If the child enters school at a proper age, I think not; but I think the "kindergarten" department the proper place for a child until he is at least six, and better, seven years of age.

4. I have no knowledge of such a case.

5. For the good of the school and the average pupil, I think not.

6. It should appear as absence, other records showing scholarship, etc.

7. In few cases, perhaps; not generally.

10. In the larger schools the courses might, perhaps, be made partially elective with favorable results, but I think not in most schools. As to thorough work and rigid examinations the danger is of being too slack.

11. I think not. We aim at having pupils learn facts, not details.

12. The best teachers of any branch must be "specialists" and "experts," but, I think, those will prove the best instructors who have become proficient, not from intuitive knowledge, but from acquisition of a thorough knowledge by the persistent overcoming of difficulties as found by the average student, as they then well understand and appreciate those difficulties, and can best assist the learner. For example, I think a well versed American a better teacher of French or German than a native teacher.

14. Most certainly I should.

Very truly, O. C. SEELYE,

Owosso, Mich., Feb. 22, 1882. Supt. of Schools.

REPLY FROM E. V. W. BROKAW, OF ST. CLAIR, MICH.

1. *Do not think it is.

3. Greater to girls, if there is any injury.

4. I have personal knowledge of two cases, where death resulted from overwork, but it was not required, and in both cases the pupil was promoted at the urgent request of the parent.

5. No, sir,

6. Usually, everything but sickness.

7. There may be in a few individual cases, but a careful teacher will watch them.

8. Not noticeably.

9. As a rule, good.

10. Not in this school—possibly it may in some.

11. Usually, yes.

12. No; they do not comprehend how difficult these things may be to some.

13. No.

14. Yes, emphatically. To the general principles of physiology and hygiene, whether in the regular course of study or not.

Very truly yours,

E. V. W. BROKAW.

St. Clair, Mich., Feb. 20, 1882.

REPLY FROM N. P. COLLINS, SUPERINTENDENT OF GRADED SCHOOLS OF HOMER, MICH.

1. *No.

3. Girls.

4. No.

5. I think not.

6. I think not, if the pupil is willing to, and does finally "make up" the work missed.

7. Very often.

8. I think not.

9. Good ones.

10. Hardly, I think, in our graded schools.

11. Not according to the principles of the "New Education," —cf. Quincy System.

12. Rarely, I fear.

13. Should consider it unwise in our smaller graded schools.

14. Yes. Nothing is more important for young persons to know and observe than nature's laws.

Respectfully yours,

N. P. COLLINS.

* The numbers beginning paragraphs refer to questions on page 68.

REPLY FROM JOHN A. STEWART, OF MONROE, MICH.

1. *I think not. They would be too easy for the average scholar if arranged to suit a sickly person. There is always, however, some risk of overwork, but too frequently injuries received outside are placed to the discredit of the school.

4. I have not.

5. No.

6. Not to his discredit, but an absence is always an absence.

8. No.

9. Generally poor.

11. Not in my own experience.

13. Never below the high school, and I doubt its advisability even there.

14. We teach them here.

Sincerely yours,

JOHN A. STEWART,

Monroe, Feb. 20, 1882. *Prin. Pub. Schools.*

REPLY FROM C. B. THOMAS, SUPERINTENDENT OF SCHOOLS, BAY CITY, MICH.

1. *As a general rule, no. There are exceptions to all general rules.

2. Overstrain of nervous system, if any.

3. To girls.

4. I think I know of a few cases.

5. I think not as a whole. Some delicate children, eager to keep a high record, need check. Parents ought to apply it. But one such case as this is balanced by a hundred, in which the utmost efforts of teachers and all the powers of discipline are defeated by demoralized children and indifferent parents.

6. No, certainly not as to scholarship. If, however, the attendance of pupils is reported at all, either by actual days or by percentage, I think the exact truth should be told.

7. Possibly, to some extent. I am inclined to think, from a long and watchful experience, that the tendency shows itself rather in the aggravation of inherited constitutional conditions, than in causing those conditions; that the work of the school discovers, but rarely produces, these conditions.

8. On the average, and excluding "luck," yes.

9. Almost always, *good*.

10. I think so.

11. In my own experience I think not.

12. Probably not. They naturally overestimate the average grasp of the child's mind, in their special department.

13. I think so. Children would have more freedom, more out-of-doors exercise and liberty during day-light.

14. Yes.

Frequent written examinations, on which much is made to depend, tend to irritate and excite to an unnatural and unhealthful degree, and ought to be discouraged.

Hoping for profitable results from the contemplated meeting, I am,

Yours with great respect,

C. B. THOMAS,

Supt. City Schools.

Saginaw City, Feb'y 18, 1882.

REPLY FROM PROF. C. G. KINGMAN, OF CORUNNA, MICH.

1. *Yes, if you complete the full curriculum of studies as given in most catalogues, and schemes of school boards;—no, if the *actual work* of the school room is concerned. It is not the "number or character" of the studies that does mischief; it is poor teaching, poor ventilation, poor heating, and poor accommodations generally.

2. The ill effects of the last conditions (altogether too general), are nervous ailments, near sight, failing memory, stunted growth, morbid imaginations, and a lowering of the whole moral and physical tone of the system.

3. To girls; very largely greater; as boys work off some of the ill effects by more out-door exercise, and by a total change of occupation when out of school.

4. *Very few*, within my own experience and observation; nevertheless I know of some isolated cases I could quote.

5. I think not generally. On the contrary, I think there is too much laxity in that respect.

6. Certainly *not*, "if *properly* accounted for."

7. Only so far as the conditions of bad ventilation, bad heating, bad accommodations, and bad teaching obtain. But as a matter of fact and statistics, perhaps I should be obliged to say, Yes.

8. Not always, perhaps not generally, if you define "precocity" as merely an abnormal *mental* development. But *bright* pupils *do* take the lead, when backed by native energy and perseverance. Nor is this "energy" altogether physical; it seems to me to be quite as much the result of a strong aggressive will power, as a mere matter of beef.

9. Neither, as a matter of discrimination. In the average grades, I should quite as soon say the "poor scholars" break down sooner than the "good" ones. In the high school, good students sometimes break down when they are "foreign" pupils, laboring to get through four years' work in two, for the purpose of saving expense.

10. They certainly can; and in the hands of a good teacher, the three points called for *are* often met.

11. Yes, I think so, in lower grades especially.

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* The numbers beginning paragraphs refer to questions on page 63.

12. Not always. A teacher of general experience in all kinds of school work and instruction is a far better judge, it seems to me.

13. I think it is, provided there be frequent recesses for young pupils, and opportunity be given to all, both old and young, for exercise and a moment's "breathing spell" at intervals. I think it is better to have the school session in the early part of the day, because the mind and body are both fresher in the forenoon than in the afternoon; the ventilation is apt to be better; the power of attention can be concentrated better; and pupils of average age will not actually get so jaded as if kept till 3:30 or 4 o'clock P. M. If school begins at 8, primary children should be allowed to go home at 11 A. M.—three hours are enough for them.

14. Most certainly. I think they should be made compulsory by school statute law. Nothing is more neglected than care for the "fleshly tabernacle of God" As a partial answer also to this question, and as a summary of my comments, I wish to emphasize the opinion that *it is not intellectual crowding* that does harm in our graded schools; it is the shameful physical neglect, on the part of school boards and builders, that does not put into every school-room the means for almost automatically regulating the ventilation and heating. I say "*automatically*," because janitors and teachers, and even superintendents, do not use the other and common means as they should.

The foregoing observations and replies are based on a teaching experience and outlook of fourteen years in the States of Me., Mass., N. Y., Penn., N. J., Md., and Mich.

Very truly yours, C. G. KINGMAN, A. M., *Supt.*

Corunna, Mich., Feb. 22, 1882.

REPLY FROM Z. C. SPENCER, OF BATTLE CREEK, MICH.

1. *I do not consider the work of the graded schools too heavy for the average pupil. I am not now speaking of either dullards or geniuses. This statement requires some modification or explanation. The curriculum of studies as laid down in the graded schools of this State is pretty uniform. In some schools pupils are admitted at five years; in others at six years of age. I think that pupils should not be admitted to the work of the first or lowest grade until they have reached the age of six years.

2. Where pupils are admitted too young (five years) the tendency is to get into succeeding grades before they are fully prepared, and hence are apt to become superficial scholars. I cannot say that it has been my observation that the health of the children has been either injured or threatened.

4. In my experience of twelve years in Michigan as a superintendent of schools, I can recall no such instance.

5. Emphatically no, as conducted in our best schools under the supervision of careful and experienced superintendents. The sum and substance of this matter is, *any parent can keep his boy or girl out of school just as much and as often as he pleases.* Such pupils may be temporarily suspended, but in 999 cases out of every 1000—I do not exaggerate—they are restored.

6. Yes and no,—no if a pupil has been out of school, *e. g.*, two or three weeks, especially a pupil in the high school department, through family affliction, and necessarily, he should not be credited with a knowledge of a subject *which he does not possess.* It is a good plan to conduct a school on principles of justice and equality, to require the same and just such deportments from pupils as we see in good society, and to give a boy or girl credit for just what he or she is entitled to and no more. To do otherwise would convey to him or her false notions of life which would have to be done away with in after experience to his loss, and often bitter diappointment and mortification. A man who works by the day is paid by the day; if he, through illness or other reason which may be perfectly satisfactory to his employer, loses a week or two weeks, he cannot and does not expect compensation for labor not performed. Yes, if the absence is occasional and necessary, and if only of short duration,—I speak now of the high school. In the lower grades considerable absence is allowable, and need not prevent promotion.

7. I have failed to discover any such tendency.

8. They have not in all cases. In a large majority of instances, however, it must be acknowledged that the bright, attentive student makes the successful man.

10. Perhaps they can. In our high schools pupils who are faithful in attendance, and who, we think, understand the subject, are excused from written examinations. We form our estimate of a pupil's knowledge of a subject by various ways, as daily recitations, intelligence in recitation, black-board work from day to day, and by a mental survey of the pupil's *tout ensemble* during the preceding four or six weeks. I am not certain, however, that this excusing from written examinations will not work out superficiality, and fail to secure that broad grasp and classification which our young people so much need.

11. I think not.

12. I am of opinion that they are prone to overestimate the ability of children to grasp the subjects of which they themselves are masters.

13. I prefer a forenoon and an afternoon session.

14. It is very desirable.

Battle Creek, Mich., Feb. 20, 1882. Z. C. SPENCER.

REPLY FROM J. C. JONES, SUPERINTENDENT OF SCHOOLS, EAST SAGINAW, MICH.

1. *In many schools, yes.

2. Inability to accomplish definite work successfully, so as to strengthen mental tenacity—mental growth—thereby nervousness results.

3. I know no difference.

4. None.

5. I do not think so.

6. No. Systems of marking should be made means, not results in a school economy.

7. If I understand this, I do not think there is.

8. I know of none that were pronounced in their precocity so far as book knowledge is concerned, that ever lead in life. But that which makes a man noted and a leader in the world is acquired out of school. Schools are not for such purposes.

10. Courses of study should contain less, examinations reduced to a minimum.

11. In my experience, no.

12. I think they are not. Age forgets the steps childhood takes and must take in acquiring knowledge.

13. For high schools, yes: other grades, no.

14. Most certainly, I would.

I regret I have to answer so briefly your questions, for I am much interested in the matter here presented. I hope, sir, you will discuss the question from its broadest standpoint, and not seek to lay all the ills childhood and youth suffer as to their health to the schools or their courses of study. Remember that the schools take the children at an age, and in an age, when parents, in addition to school duties, require piano practice, amateur theatricals, permit party going, and party making, and send all to dancing schools. Mind is in no condition to receive instruction when the body is weakened by such practices. When will parents see this! Schools are not responsible for ill results when such things are common. Respectfully,

J. C. Jones,
Supt. Schools.

East Saginaw, Mich., Feb. 20, 1882.

REPLY FROM A. J. DANIELS, SUPERINTENDENT PUBLIC SCHOOLS, OF GRAND RAPIDS, MICHIGAN.

1. *Much depends on the teacher; the subjects in my opinion are not too many or too difficult if presented as they should be. There is too rigid adherence to the text; too much hearing of lessons—too little explanation.

2. The evil results are over-anxiety on the part of pupils lest they shall not meet the requirements of the teachers, making them nervous and irritable at home.

3. The harm that comes is to the girls mainly.

4. I have no positive knowledge of such cases.

5. Not in this city.

6. If marking indicates scholarship, frequent absence, even though necessary, will necessarily effect the marking.

7. See answer to the second question.

8. Many cases can be cited on both sides. I should say that usually they have.

9. Generally the poorer class of scholars whose ill-health is plainly attributable to late hours, undue exposure, and intemperance in eating and drinking.

10. In our high school where there is greatest liability of harm, all pupils, if it be the wish of parent's, are allowed to elect their studies. I think too much stress in the past has been given to examinations. There is now a tendency to the opposite extreme.

11. I think there is, especially in history, too much attention given to the details. If teachers would require only the most important events to be learned and more ground to be passed over, the subject would have greater attractions.

12. They are not, and for this reason scholars are made to suffer much undeserved blame.

13. I think two sessions preferable for the health of pupils, though less convenient.

14. No subjects are less thought of. Teachers are woefully ignorant of the most common laws of health. In their efforts to improve the intellect they forget everything else, health, and morals, and manners, especially the former. In a majority of cases, I find that pupils seated in the back part of the room (in houses heated by stoves) have cold hands and feet. In this respect, however, our schools in most cases are an improvement on the homes from which the pupils come.

Very respectfully,

A. J. Daniels,
Superintendent.

Grand Rapids, Feb. 21, 1882.

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*The numbers beginning paragraphs refer to questions in a circular on page 63.

REPLY FROM CHAS. W. HITCHCOCK, OF PAW PAW, MICH.

In reply to your circular received yesterday:—

1. *Generally speaking, no. Of course there are exceptional cases where it is necessary to use more discretion and less rigidity.

3. Taking all things into consideration, I should say, to girls, as I think to them much climbing of stairs often brings serious results, where boys are not affected, or perhaps, benefited by the exercise.

4. Have knowledge of cases where pupils' health would at least be improved out of school.

5. Do not think it is, for the average scholar. In cases of poor health, discretion should be used in regard to leniency shown absent pupils.

6. I think sentiment of both scholars and parents should be educated in respect to absence, and scholars should be brought to think of excusable absence (as for sickness) not as a disgrace, while parents should be so educated that they will co-operate with teachers and send no excuse for absence unless such absence is really justifiable and excusable. Thus all absence would appear, but only unexcused absence as a disgrace.

7. Think not, if proper amount of exercise by scholars is ensured.

8. From actual experience in public schools, cannot say; but think the rule, which is seen to be true in college, would hold good here too. In college, it is well known that the precocious students are not always, or as a rule, the most successful men, or those who are the most "shining lights" in the world.

9. Know of cases of poor health both in good and poor scholars.

10. It could, if you could depend upon the honor and earnestness of all pupils; but it is too often true that, where you "give them an inch they will take an ell." At present do not think elasticity could be greatly increased, without decided loss in efficiency.

11. Do not think so, generally, but think it might be well to take more time for (such studies as U. S. history.

12. Think such experts are apt to be prejudiced in favor of students of their departments, and so very liable to decry and belittle the difficulties encountered by students. Still, conscious of this fact, and so being on their guard, such experts should be good judges of said difficulty.

13. No. Think the relief which the one and one-half hours "nooning" gives is of great value to the scholars, and think that, taking the schools right through, better work can be done with two sessions than with one five-hour session.

14. Think teachers, from lowest grades up, should strive to keep their pupils informed on the most important principles of hygiene, and should endeavor to secure to their pupils better health (and for themselves better work) by having suitable exercises of whole school, each day about middle of session, and that in high school, physiology should occupy a prominent place in the course of study. Yours very respectfully,

CHAS. W. HITCHCOCK,

Paw Paw, Feb. 19, 1882. *Principal of Schools.*

REPLY FROM W. W. WENDELL, OF HUDSON, MICH.

1. *There are probably too many studies.

2. The mind is not disciplined to consecutive thought.

3. On the nervous temperament to girls.

4, 5. No.

6. Yes.

7. Possibly.

8. Yes.

9. I have noticed no difference in the number.

10, 11. Probably.

12. No, I think they are not fair judges.

13. I think a continuous session is not preferable.

14. Yes.

Yours truly, W. W. WENDELL.

Hudson, Mich., Feb. 17, 1882.

REPLY FROM J. W. EWING, SUPERINTENDENT OF IONIA SCHOOLS.

1. *I do not think it is.

3. To girls.

4. No.

5. I think not.

6. I do not see how a scholar can receive credit for what he has not done.

8. I do not think they have.

9. In the case of boys they have generally been good scholars: in the case of girls they have more generally been poor scholars. The girls in my opinion break down in health from other causes than study.

10. Yes.

11. We do not in our school.

12, 13. I think not.

14. I would, most assuredly.

Sincerely yours, J. W. EWING,

Ionia, Mich. *Supt. of Schools.*

REPLY FROM CHAS. O. HOYT, SUPERINTENDENT WYANDOTTE PUBLIC SCHOOLS.

1. *Yes.
2. Pupils are unable to do the work thoroughly; and to greatly impair the health of many.
3. Girls, especially at a certain age.
4. Nothing special.
5. It is not here.
6. No.
7. I have not observed any.
8. No.
9. Very good.
10. I think so.
11. No.
12. They should be, but are not always.
13. No.
14. Yes.

Very Respectfully, CHAS. O. HOYT.
Wyandotte, Mich., Feb. 21, 1882.

REPLY BY M. T. GASS, SUPERINTENDENT OF THE FLINT CITY SCHOOLS.

Your circular of inquiry of Feb. 14 is at hand. I last year had a paper upon the subject you are to present, at the sanitary convention held in this city. [See pages 78-83 of the Report of the State Board of Health for 1881.] If the papers there read were yet out of press where they are being published, I would refer you to mine for an answer to the queries you put. As they are not, I will briefly give you my opinions here, numbering answers to correspond to the numbers of the questions:

1. *I think not. I find by a careful examination into the ages of pupils in the various grades, that they will gain time of their own choice, by performing more than is required of them, and that pupils will on an average in the course of eight years, gain about one-half year each.
2. Answered by the above.
3. To girls.
4. During eight years, and with about 4,000 different pupils, I know of but one such case.
5. No.
6. I will answer this hypothetically: If parents were discreet and would render account for absences only that are excusable, and pupils who are disposed to be truant would take no advantage of such leniency, I would say no; but having to take things as they come to us, I say yes. I know that by this very system I have during the last year increased my per cent of attendance about four, and that too without detriment to the health of pupils.
7. I think very little, if any.
8. No; the hard workers have.
9. Usually good. Not always.
10. No more elective in the lower grades. More freedom of choice might perhaps be granted in the last two grades of high school. The results of examination should not be the sole condition of promotions. The daily work and general reviews should each enter in as equal factors with examination to determine grade standing. This would relieve examinations somewhat of their exacting character.
11. Sometimes by teachers; not, I think, in the nature of the course.
12. Not necessarily so.
13. I think not, especially below high school.
14. I would increase it in most schools; for in most of them, particularly in country, it is almost wholly neglected.

Respectfully yours, M. T. GASS, *Supt. City Schools.*
Flint, Feb. 20, 1882.

REPLY FROM HORACE PHILLIPS, SUPERINTENDENT OF SCHOOLS, GRAND HAVEN.

1. *Too much when in high school pupils have more than three full studies each day.
2. Unnatural nervous condition.
3. Girls.
4. Personally know but two cases.
5. Probably so in the primary department.
6. No. A pupil should be marked on the knowledge he possesses.
7. Sometimes.
8. Uncertain.
9. Usually good.
10. Hard to say, as courses are so different. I believe in exact work and in good examinations on essential points.
11. About fairly proportioned.
12. No. Are almost sure to underrate difficulties of children.
13. No.
14. Yes.

Respectfully, HORACE PHILLIPS, *Supt. of Schools.*
Grand Haven, Mich., Feb. 20, 1882.

REPLY FROM FRANK LANDON, OF NILES, MICH.

1. *It is in the primary department of some graded schools, and quite frequently in ungraded schools where pupils of different ages are grouped together.

*The numbers beginning paragraphs refer to questions in a circular on page 63.

2. Nervousness—hysterics.

3. Girls.

4. 5. No.

6. I think not.

7. See 1.

8. Not to any remarkable degree in any case, and more frequently the contrary.

9. Have observed few such cases—none where breaking down could fairly be attributed to study alone.

10. I think examinations might be almost totally abolished; elective system increases a common disease called laziness.

11. I think not according to present requirements of our university.

12. Hardly fair judges, since they ordinarily become specialists from having a "leaning" by nature toward their specialty.

13. In my opinion such sessions are fatal to both health and scholarship.

14. Decidedly yes, and still more decidedly a more thorough knowledge should be required in those licensed to teach.

In my humble opinion the graded system can be made less "cast iron," and it is but just to the public schools to say, that the tendency is in that direction—recent agitations have been prolific of good results. Examinations and exhibitions may be done away with, too, with no loss to the efficiency of the system. Their effects on pupils of nervous temperament are unquestionably pernicious, and I believe all teachers will agree that the results at the best are unsatisfactory. "Cheek" more often wins than merit. The most thorough and conscientious pupils dread examinations the most, and under nervous excitement rarely do themselves justice.

Great damage is caused by the employment of young, thoughtless, and too often ignorant persons as teachers,—the cause of this in many cases is the poor salaries, often insufficient to command ordinary talent, "let alone" professional training. Even professional training, except in the school-room, is apt to run in a groove. Normal graduates often have acquired only self-sufficiency and a supposed ideal way of teaching and governing the ideal pupil—too little attention is paid to the study of the particular mental, moral, and physical nature of individual pupils.

Respectfully, FRANK LANDON.

Niles, Feb. 20, 1882.

REPLY FROM GEO. P. GLENN, SUPERINTENDENT, MARSHALL PUBLIC SCHOOLS.

1. *No, if pupils are not allowed to jump grades which lie beyond their years. Yes, if precocious children delude vain parents and indifferent school authorities into rapid promotion in early years of school life.

2. In the latter case I have observed a very sudden stagnation of both mental and physical energy.

3. I can mark no difference.

4. No, sir.

5. In many places it is, but not from a hygienic standpoint: *e. g.*, I think that suspension for absence, which custom prevails in Michigan, is not only wrong but absurd, defeating its own purpose.

6. By no means.

7. No, sir; except in cases coming under the second condition under No. 1, above.

8. No, sir.

9. I have known no cases in point except among young ladies of our high schools, who are usually good scholars, but their difficulty has not been in weakening of mental energy, but an inability to climb the long flights of stairs to reach the third stories of our high school buildings. In our own schools I am advocating the inversion of the departments and grades of our central building, placing the high school on the ground-floor and the grammar grades in the second and third story, with the youngest at the top. As they grow older and advance in their work, they will come downward year by year. Thus when the girls arrive at an age when the climbing of staircases ceases to be good and becomes bad physical exercise, they will in general be on the ground floor. I do not see why all of our old high school buildings cannot be utilized in this way, instead of building new ones of one story.

10. The relaxing or elasticity can be granted without loss of efficiency, but election, if applied to the quality or kind of work, will bring loss of efficiency; if applied only to the quantity of work it will not produce loss of efficiency, while it may often increase it.

11. I think not.

12, 13. No, sir.

14. I would not advise less. I think that enough is now given (with few exceptions) if it were only well heeded. More study and practice of this kind in our homes would be more advisable.

Yours truly,

Marshall, Mich., Feb. 24, 1882. GEO. P. GLENN.

REPLY FROM MISS M. LOUISE JONES, SUPERINTENDENT OF CHARLOTTE SCHOOLS.

It gives me pleasure to herewith transmit the answers to your interrogations. I cannot ask you to rely much on them for they are based more upon my experience as principal of high schools and observations of the lower schools than upon any actual experience as superintendent. This is my first year in the work.

1. *Too much work is required in many schools. Here we are trying to do less, not in quality but in quantity.

2. Ill effects on girls—excessive nervousness. Ill effects on boys—tendency to truancy from and final abandonment of school before prepared for high school.

3. The proportion is greater of boys who fail to enter the high school than of girls who fail to keep their health.

4. No "cases of illness fairly attributable," etc., during past four and one-half years in Charlotte.

5. The discipline is not too exacting.

6. Absence properly accounted for should not appear to the discredit of the student.

7. I do not detect much tendency to over-stimulation.

8. We have here too few precocious children to form an opinion.

9. In every instance but one, poor scholars.

10. I think not, if we would have him symmetrical.

11. We permit only three studies at once. *a*. One for memory. *b*. One for perception. *c*. One for reason. *d*. The discipline of the creative faculty comes in as supplemental work in *a*, *b*, and rarely *c*.

12. Specialists as a rule are incompetent judges.

13. Two sessions per day preferable.

14. Too much attention cannot be given to physiology and hygiene.

For the first time in five years the boys here outnumber the girls.

Very respectfully,
M. LOUISE JONES,
Superintendent of City Schools.

Charlotte, Mich., Feb. 20, 1882.

REPLY FROM WEBSTER COOK, SUPERINTENDENT OF SCHOOLS OF MANISTEE, MICH.

Before replying in detail to your inquiries let me state that my experience in this profession has been only during the last three or four years and confined to but two schools, both in this State. My opinions will therefore lack that maturity of judgment which you will receive from superintendents of longer experience. However, to some of your questions I think there is no ground for two opinions.

1. *In the number of branches pursued in the various departments of our schools I have found no ill effects so far as my experience goes. In the character of the work, I think too difficult work is required in many studies below the high school. This is especially true of arithmetic and geography. In arithmetic, for instance, a knowledge of principles and their applications is required of children when the same knowledge would be difficult even for mature minds to master.

2. The general result is the dislike for study which all the pupils in certain schools sometimes acquire. Another result of this course when carried to extremes is that pupils are partially or wholly incapacitated for learning even under correct instruction. Two instances of actual occurrence in these schools will illustrate these points. A little girl was crowded ahead from year to year and as she seemed very bright, passed by one or two classes. Suddenly she failed. My attention was called to her case soon after I began my work in these schools. She was put back one class but still failed, and I put her back another. I have not thought it best to put her back any farther, but she is doing very poorly. Her health is not good, but much is due to imperfect sanitary conditions at home. She is very nervous and her school work may have had something to do with that. I have also a class in the grammar school crowded ahead under former management in rder that all grades might be full. They have since been put back, but under the most faithful teachers are unable to do even passably good work and seem simply incapable of learning. The fact that the primary arithmetic course in these schools has been too difficult for the pupils has given us a school of very poor mathematicians. Some of the classes are suffering very perceptibly from too severe drill in primary arithmetic.

3. The only cases of extreme nervousness have been among the girls, or rather one case among the boys has been called to my attention, and three or four cases among the girls. But with these the improper ventilation and the inadequate supply of heat in the school room on the one hand and unhealthy conditions at home had as much to do, probably more, than school work proper. But in the unfitting of pupils for study I am inclined to think the boys suffer more than the girls.

4. I have known two cases of rather protracted nervous prostration, but think both have fully recovered.

5. I do not think the rather strict attendance rules in this State result in any affections of health

6. I think that pupils absent from unavoidable causes should not be made to feel that those absences were in any way discreditable to them. I have no sympathy with "Rolls of Honor," and

*The numbers beginning paragraphs refer to questions in a circular on page 63.

systems or rewards based upon attendance regardless of causes of absence. I believe them wrong in principle and practice.

7. To pupils following in regular grades I have noted no ill effects. Sometimes pupils unwell when entering school, or naturally of very nervous temperament, suffer somewhat from confinement and restraint.

8. I have had little opportunity for observation in this line, but my impression is that precocity is a misfortune.

9. Both cases mentioned above were hard workers, one a brilliant student, the other very slow. I ought to say that both these students worked to very late hours, and I always believed their trouble was caused by loss of sleep.

10. I do not think the course need be made elective or should be, nor do I think close, accurate class work inconsistent with good health, but I do think that as a rule examinations are carried much too far and too much excitement worked up in connection with them. I think by proper management they could be almost entirely dispensed with without impairing the usefulness of our instruction.

11. I think our studies appeal entirely too much to the memory and that in most cases that faculty is impaired by overtaxing.

12. From my own experience in school, I think specialists are almost sure to require too much.

13. For young pupils I think five-hour sessions out of the question. For high school pupils I think one five-hour session the better; but as my experience has all been with two sessions a day, my judgment is not based on any facts of direct observation.

14. I think that physiology and hygiene should be begun as soon as the pupils can understand the most elementary facts and principles, and continued throughout the entire course. The present neglect of this branch is shameful and incomprehensible.

In conclusion I ought to say that the most fatal defects in our system of education from the health point of view are the imperfect arrangements for heating and ventilating. Outside of the very largest cities of the State the provisions for these are utterly inadequate or none at all. To illustrate, the larger buildings are heated by furnaces. In every case the supply of heat is utterly inadequate. The result is, I often enter school rooms with the temperature not above 60° F., and the air so close and foul as to be sickening. I have known of many cases of sickness, and some of them fatal, which I am satisfied these causes had much to do with.

Very respectfully,

WEBSTER COOK,
Supt. Schools.

Manistee, Mich., Feb. 20, 1882.

REPLY FROM PROF. D. PUTNAM, OF THE NORMAL SCHOOL, YPSILANTI, MICH.

1. *Not in the majority of schools.

2. Few that can be charged specially to the schools.

3. Probably to girls.

4. I think a few, but usually other causes were combined.

5. In some cases.

6. Certainly not.

7. Some.

8. Not as a rule, I think.

9. Generally good.

10. Yes.

11. Not generally.

12. Not as a rule.

13. Not for young children.

14. Yes, if teachers are competent to teach it wisely; otherwise, not. Truly yours,

D. PUTNAM,
Acting Principal of Normal School.

Ypsilanti, Mich., Feb. 20, 1882.

REPLY FROM W. S. PERRY, SUPERINTENDENT OF THE ANN ARBOR PUBLIC SCHOOLS.

1. Possibly a little too much in "number of studies," but I am not certain of it.

2. Nothing noteworthy, especially of a physical nature.

3. Girls can accomplish the course of study as easily as boys when they have as good a chance, but their habits of life repress native vigor and render them more susceptible to injury.

4. I cannot recall such a case in my experience.

5. I do not think it is, all interests considered.

6. Most assuredly not.

7. Probably there is, to some extent, in the high school. Pupils are frequently over-ambitious and attempt too much, but they are not encouraged in it by the teachers, nor does the course of study demand it.

8. I have not followed the history of precocious pupils; indeed I doubt if we have had any markedly such.

9. By far the larger part of our absenteeism from sickness comes from poor scholars.

10. I wish they might, but I dare not recommend any less exacting methods, unless it be to do away with lower grade examination. Some educators favor it. I am in doubt.

11. I think not, except in classes managed by poor teachers.

12. Teachers, especially good teachers, are better for being specialists in the subjects taught.

13. I incline, not strongly, to the affirmative.

14. Yes, emphatically.

Respectfully,

W. S. PERRY.

Ann Arbor, Mich., Feb. 22, 1882.

REPLY FROM PROF. H. V. CHUTE, OF THE HIGH SCHOOL, ANN ARBOR, MICH.

1. *No.

3. There is no risk of injury in either case when regular work only is attempted and proper habits are observed.

4. I never knew of a case of serious illness in our school caused by over-work when the student was carrying regular work only. On the other hand there have been many cases of sickness clearly attributable to bad habits of either dressing, living, or studying, when "over-work" was made the scape-goat.

5. No. The rules now are very liberal, every reasonable opportunity for a student to be absent being given.

6. The answer to this question turns on what is to be understood by "properly accounted for." As defined by the rules of our school board, and I cannot conceive of any other reasonable definition, it is a slander on an honorable body of men and women to assume that any teacher ever adopted a system of marking where absences properly accounted for appeared to the scholars' discredit.

7. No, not when regular work alone is attempted.

8. Precocious scholars are very rare. I have had fifteen years' experience, and I have not yet met with a John Stuart Mill.

9. I have been unable to discover any law governing the matter, except this: that health has not been determined by scholarship but rather by the habits of the scholar, and scholarship has depended on the industry of the student.

10. Every freedom is now offered consistent with efficient work. There is a certain sequence of studies that must be observed. Of that order, neither the scholar nor the parent is a competent judge in ninety-nine cases out of every hundred.

11. I think not.

12. The better a teacher understands his subject, the better he can smooth down its difficulties. It is also possible, however, for a man to be a specialist and be no teacher.

13. Most emphatically is a continuous session preferable in a school organized on the plan of the Ann Arbor high school, the objective point, I presume, of this question.

14. I would advise the study of hygiene in our schools, and strongly insist on the practice of its teachings in the home. Then the preceding thirteen questions will be found pointless; for given a sound mind in a sound body and a strict observance of nature's laws, and you will never hear of overwork except from the lazy, and our poor-houses will be filled with doctors.

Respectfully submitted.

Ann Arbor, High School, Feb. 24, 1882. H. V. CHUTE.

REPLY FROM PROF. J. G. PATTENGILL, OF ANN ARBOR, MICH.

At the request of Supt. Perry, I have made out the following answers to your questions on school hygiene. The answers are for the four high school grades only, having no reference to grades below.

1. *No; the course is adapted to the average pupil, and is carried by such without difficulty, if regular in habits.

2. None.

3. I have observed no difference.

4. Yes; but in each case the pupil was doing more than the regular, prescribed work, trying to complete the course in less than the established time. I know of but one case in the last six years where a regular pupil broke down from overwork, and that pupil was taking a full course in music outside, besides doing housework at home. Many cases of breaking down have occurred from working during vacations, in direct opposition to the advice and in spite of the warning of the teachers. All these cases have been pretty evenly divided between the sexes and grades of scholarship.

5, 6, 7. No.

8. Not always.

9. See last part of answer to question 4.

10. No; if a student does not wish to prepare for college, there is a large liberty given now in choice of studies. The change of marked examinations from the written monthly to weekly oral form has reduced the rigidity to as low a point as is consistent with efficiency.

11. No; I think the tendency is to the opposite extreme, leaving the memory too little cultivated.

12. Depends on the man—if he has common sense, yes; if not, no.

13. Yes; it requires the pupil to spend less time in the school-room and gives time to do more work by daylight.

14. Yes.

Respectfully,

J. G. PATTENGILL,
Prin. High School.

Ann Arbor, Feb. 23, 1882.

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*The numbers beginning paragraphs refer to questions in a circular on page 63.

REPLY FROM H. S. MCMASTER, M. D., OF DOWAGIAC, MICHIGAN.

1. *Yes; as to both number and character. They are hurried along too fast.

2. Too rapid development of the nervous system. Illness.

3. Neither—equal.

4. Yes.

5. In some schools.

6. No.

7. Yes.

8. No.

9. Usually good.

10, 11. Yes.

12. No.

13. Think not, especially for some ages.

14. Yes.

Yours truly,
H. S. MCMASTER (*Formerly Teacher*),
Director Dowagiac Union Schools.

Dowagiac, Feb. 20, 1882.

REPLY FROM MISS ALICE MYRICK, OF ANN ARBOR, MICH.

1. *No; not in number of studies, sometimes in the character in grades above the lower ones.

2. They get discouraged and soon fall behind their class, otherwise I don't think there is any apparent injury to their health.

3. The boys and girls in schools with which I have been connected have not been injured by taking the regular work of the school. I might make one exception here in regard to one or two cases in which students have injured their eyes, which, being weak at first, were made much worse by study.

4. No; not in taking the regular course, and I have been connected with schools for ten years.

5. No.

6. No; excepting as absence necessarily puts a scholar behind in his classes.

7. Not usually, I think.

8. No.

9. Good scholars; in trying to take the four years of high school work in three.

10. Not more elective below the high school. I do not think the system of marked examinations should be relaxed in any degree. I do not think a person can be too careful in the closeness of marking papers.

11. I think not generally.

12. I think not, if they have good judgment combined with their skill.

13. It seems to me that it is—with frequent short recesses for lower grades.

14. Yes.

Ann Arbor, Mich. ALICE MYRICK.

REPLY FROM V. M. SPAULDING, OF ANN ARBOR, MICH.

1, 2, 3. *I do not believe the work required in our graded schools is too exacting as a rule. The parents of dull children are always heard complaining that their children are overworked. It is the duty of parents to see that their children are not put into higher grades than they are ready to enter. This will prevent overwork. It is entirely inconsistent for a parent to demand that his child shall be promoted whether ready for promotion or not, and then complain because the child has to work too hard. It is this very practice that produces the popular outcry about overwork in the schools.

4. No such case has come under my observation.

5. It varies greatly and depends upon the superintendent very largely. The general rules about attendance are all right. Possibly they are sometimes pressed too far.

6. Absence on account of sickness ought not to appear to the discredit of the scholar.

7. In case of delicate children probably there is. The parent is equally responsible with the teacher in such cases; probably more so.

8. The "bright" scholars have remained bright, the "dull" ones, for the most part, have continued dull in practical life. My work has not been in grades where precocious children are found.

9. Scholarship has nothing, or almost nothing, to do with health. Late hours, too much company and excitement, etc., etc., are what injure the health of scholars in the public schools. Cigarettes certainly do destroy the boys' health, but I never knew one to be hurt by study.

10. The examinations in many of our public schools are, or have been, a very severe strain upon the nervous system of both pupils and teachers. As they were conducted seven years ago when I taught in two of the prominent high schools of the State, they were unreasonably frequent and exacting. I have no faith in elective studies in the graded schools. Let a reasonable, but perfectly definite amount be required.

11. I believe not. This depends on the individual teacher, and some teachers do not exercise good judgment.

12. No.

13. Have only tried the latter plan.

14. By all means.

I had but a few minutes at my disposal and cannot speak as fully of some of the questions as I would like to; may have made mistakes in some of my answers, but speak only of what I have seen in my own experience.

Yours truly,

Ann Arbor, Feb., 1882. V. M. SPAULDING.

REPLY FROM W. E. BELLOWS, SUPERINTENDENT OF THE ALLEGAN PUBLIC SCHOOLS.

1. *No.
3. No risk of injury.
4. None whatever.
5. No.
6. No. It does not and should not.
7, 8. No.
10. The exacting system of marked examinations can be relaxed.
11. Yes—sometimes.
12. They ought to be.
13, 14. Yes.

Respectfully,

W. E. BELLOWS,

Allegan, Mich. *Supt. Schools.*

REPLY FROM GEO. E. RANNEY, M. D., LANSING, MICH.

1. *Yes.
2. Such as come from overwork and taxation of the nervous system, and hence too numerous to mention in a short communication.
3. Girls.
4. Yes.
5. I think so, at least as regards well disposed scholars and children properly governed at home.
6. No.
7. Yes.
8. No. The reverse I believe to be nearer true.
9. Good.
10. No, probably not as a rule, though I think great care should be exercised by the teachers
11. Yes, especially as regards the latter.
12. I think not, as a rule.
13. I think not.
14. Yes.

I do not think sufficient work should be imposed on a pupil to cause fatigue. Some can do more work without fatigue than others of the same age, and then ages vary very much as regards the time they can pursue successfully advanced studies, without injury to themselves.

Lansing, Feb. 20, 1882. G. E. RANNEY.

REPLY FROM L. S. STEVENS, M. D., OF MUIR, MICH.

In answer to your circular of Feb. 14, I would say to question—

1. *I believe the work too much in number.
2. The student is confused and does not thoroughly comprehend or master any of them.
3. I would judge to girls, as it overtaxes their nervous system.
4. I am satisfied that some of my patients have suffered long illness and nervous prostration, inducing chorea in some cases, from overwork in schools.
5. I think so.
6. I think not.
7. Yes, in order that all may come up to the requirements regardless of their ability.
8. They have not.
9. Good as a rule.
10. I think it might, but not being a practical teacher am not able to suggest in what respect.
11. I believe so, to the detriment of the reasoning faculties.
12. I think not.
13. No. Two sessions with a longer intermission.
14. Yes, I believe it would benefit the student by interesting him in that which immediately concerns his welfare.

I have been satisfied for a long time that our system of graded schools might be modified and made more practical, and I believe our school buildings should be modified so that girls in particular would not have to ascend so many flights of stairs, etc. Respectfully,

Muir, Feb. 20, 1882. L. S. STEVENS, M. D.

REPLY FROM PROF. E. S. DUNSTER, M. D., OF THE UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH.

1. *The work required of the scholars in the public schools of this place is too great both in the number and character of the studies.

2. They (these studies) take time which should be given to the proper development of the physical system. Education thus is a mere stuffing process, exercising memory alone, and wholly disregarding the higher intellectual or reasoning faculties.

3. The risk of injury is greater to girls than to boys, by reason of their generally more susceptible nervous systems, and their lack of the rugged physical culture of boys.

5. It is. One most striking absurdity of discipline in the public schools of Ann Arbor is the disciplining of a child who asks to be allowed to go out during school hours to attend to the calls of nature. This is not only absurd, but from a medical point of view it is almost criminal. It indicates on the part of the teachers a surprising and inexcusable ignorance of the physiological conditions and necessities of child life, and the exceeding dangers of violating such physiological laws.

*The numbers beginning paragraphs refer to questions in a circular on page 63.

6. It should not. Nothing but the densest stupidity on the one hand, or the most intolerant and unrelenting adherence to faulty and antiquated notions on the other, can find anything of discredit to a scholar in a properly accounted for absence.

7. There is, very decidedly.

8. They have not.

9. Very frequently they are the most advanced and precocious scholars.

10. I am confident they can.

11. They are, because the child is pushed too rapidly—but so far as our schools are concerned I think the memory is taxed more severely, and there is but little nursing or cultivation of the analytical (reasoning) faculties.

12. They are not, unless they are previously and primarily thoroughly well informed of the laws upon which the healthful and vigorous development of mind and body depend. In other words, a complete physiological knowledge of the being to be trained or taught must underlie the whole subject of education, and form the basis of all intelligent culture, and no system of education is faultless or complete which loses sight of this truly scientific study of human nature.

13. I should prefer the double session, unless the continuous one is broken by frequent recesses—not less than four of 10 or 15 minutes each.

14. Most unquestionably.

Very respectfully, E. S. DUNSTER, M. D.

Ann Arbor, Mich., Feb. 24, 1882.

REPLY FROM J. E. BROWN, M. D., OF DETROIT, MICH.

1. *The work may be large, but not usually injurious. The injury comes from being too long confined, often in poorly ventilated rooms. Good growth and development of a child want good air and exercise. Short sessions or frequent intermissions, instead of retaining a young child after the regular school hours, as a punishment.

2. Fatigue, headache, faulty digestion, imperfect sleep, etc. That irritability of the nervous system, caused from faulty nerve nutrition, instead of disintegration from exercise.

3. To girls after puberty. Probable cause from damp cold rooms, and sitting with damp attire or wet feet (not being allowed to approach a stove) several hours during the menstrual epoch.

4. Not as a primary cause. Always considered it a secondary, or complication.

5. Yes! but what can be done? All pupils do not have intelligent parents to dictate, and punctuality makes a successful and prosperous school.

6. It should not lower their standard of scholarship,—that such deductions are made for reprimand or punishment is a fact, and should be a point to emphasize against any school superintendent that allows it to be done. Nothing will cause more hatred in the pupil against the teacher.

7. Answered above.

8. No. For they learn quickly, have more idle time, get in idle habits, which spoils them in the future in every occupation. There is another class, of strumous diathesis, whose brains develop faster than the body, are the pride of parent and teacher, sent to school too early, and pushed too much. Have lost two patients at puberty from brain diseases caused from this constant cramming. Such cases are too infrequent to change school work, for these pupils are constantly advancing beyond their class.

9. Good—another class ambitious—but diseased from other causes above mentioned, that is, bad hygiene of school room.

10. Should or might be modified in special cases.

11. Think not.

12. They are not. Teachers should be guided by the majority of the class, and not complain of the seeming stupidity of others, in arts which to them are natural gifts, in which they usually excel without much effort. Any of these faculties can be so cultivated as to approximate to those who have only ordinary endowments.

13. No. The shorter the session the better, or frequently give short intermissions. One hour hard, continuous study will tire an adult, much more one younger, whose growth depends upon their activity. I look upon the five-hour session, and no intermission, as a convenience to teacher, and injurious to the pupil.

14. Yes—and by teachers and school-boards until we have properly arranged school rooms regarding the temperature, ventilation, and seats adapted to the relative size of the pupil occupying said seat. Also in regard to the light of the school-room. This improper lighting of the room, the relative position of the light and the pupil, is a prolific cause of certain diseases of the eyes, and from such irritation arise the many headaches and congestions of the brain, clouding the quickness or perception of the intellect. Then add impure air, long sessions, long lessons, etc. Correct these and we weed out the offending tare. Build the rooms on the grounds and not in the heavens—let the older pupils study at home and recite at school only.

Yours truly, J. E. BROWN, M. D.

Detroit, Mich., Feb. 24, 1882.

REPLY FROM J. H. CARSTENS, M. D., OF DETROIT, MICH.

1. *Yes, for some children.
2. Nervousness, indigestion, chlorosis.
3. Girls.
4. Answered in No. 3. No others.
5. Not in large cities.
6. No.
7. Yes.
8. If they also have tact, yes; otherwise, not.
9. Both.
10. Not able to answer at present.
11. Yes; children from 16 to 20 years will learn more in two months than young children in two years, as they have reasoning powers.
12. No; that is the great trouble.
13. No; not by any means.
14. Yes.

I answer in great haste your question, but have no time at present to go into detail. Am greatly interested in the question as a former member of the board of education, and would gladly answer more specifically but lack the time just at present. Sorry you did not send circulars sooner. Yours truly.

J. H. CARSTENS.

21 Macomb St., Detroit, Mich.

REPLY FROM E. B. WARD, M. D., OF LAINGSBURG, MICH.

I am glad the question of school hygiene is being agitated and that the dissertation on the subject has fallen into such good hands. This is a question of the most vital importance to the coming generation, and requires careful investigation.

There is no doubt in my mind that the number and character of studies forced upon pupils in our graded schools is far in excess of the average student to fully comprehend or carefully digest, and the result is that either a superficial knowledge is obtained or a mushroom growth of intellect that is powerless for good mentally, and pregnant with physical evils. As far as I have observed girls suffer more than boys, and an educated piece of household furniture is ushered into society totally unfit for the duties and trials of maternity.

The discipline of schools is often wrong in its tendency to goad the tired student to unwarranted exertion, for fear of being marked back in his classes, and so it not unfrequently occurs that the overworked student exhausts his mental force, while the dolt on maturity makes the better and more able citizen. Precocity is dangerous.

Forced attendance upon school in cases of delicate children is absolute cruelty to them, and any reasonable excuse should be accepted by a teacher except in case of a refractory student.

I am not aware that a physical wreck is necessarily a good student, but a good student is quite apt to be a physical failure. I think that studies should be more elective, and not force the plant to grow in unnatural ways.

I am not aware of ever having seen a case of fatal illness fairly traceable to over-study.

I think that as a rule teachers are too poor judges of the tastes, abilities, and temperaments of their scholars, and instead of following the bent of the student's mind, force them all indiscriminately into one beaten track.

Perhaps five hours each day is sufficient time to be spent in the school room, but it should be divided by an intermission of at least one hour and a half.

A general instruction as to the outlines of physiology and hygiene is certainly to be approved.

One other thing which the future school-house architect ought to buckle down to, and that is to have a school-house either built with all the rooms on the ground-floor or provide the building with an elevator. Those stairs are a fearful cause of trouble among girls.

Very respectfully,

Laingsburg, Feb. 8, 1882. E. B. WARD.

REPLY FROM S. S. FRENCH, M. D., OF BATTLE CREEK, MICH.

1. * Yes.
2. Too early development mentally at the expense of the physical.
3. Girls until after puberty.
4. Yes; chronic spinal irritation, etc.
5. Yes.
6. No.
7. Yes, in upper grades.
8. No.
9. Good generally.

10, 11. Yes.

12. No; specialists are poor judges generally except of their own specialty.
13. No.
14. Yes.

I give answers to the above questions on same paper; want of time is my excuse for so doing. Should have been glad to have written more fully, as I am much interested in the subject.

Respectfully,

S. S. FRENCH.

Battle Creek, Mich.

REPLY FROM JAS. C. WILLSON, M. D., OF FLINT, MICH.

I am in receipt of your circular of inquiries concerning matters pertaining to "School Hygiene." I feel quite inadequate to any mental labor, being yet very weak and feeble from a severe illness, from which I have only yet partially recovered. I will, however, try and answer your queries as far as I know.

*The numbers beginning paragraphs refer to questions in a circular on page 63.

1. *No. In our schools here in Flint the scholars are not required to do as much work, in study, as I had to do when a boy, attending a common district school in the country. Opinions may honestly differ on the character of the studies for children of certain ages.

2. I have not observed any ill effects, and I have had abundant opportunities of meeting with such, if there were any, in the last 25 years.

3. That (if there were any) would depend on temperament as well as sex.

4. I have not.

5. I think not.

6. It should not, and does not in our schools.

7. To this I answer yes. But mark you, I want to add that there can be no school system devised that will not do the same thing, in a greater or less degree. As civilization of mankind advances, the inevitable result seems to be, on the race as a whole, that the development of the intellectual is at the expense of the physical. Our schools may be in part responsible for this but they are not by any means wholly so.

8. Not always—no, not as a rule. This, however, is not the fault of the school training. The home training has often more to do with the failure than the school.

9. I know of no case, where the health was broken down either in poor or good scholars, and could be fairly attributed to school work. Of course I have known, and attended, children and young boys and young misses whose health broke down while attending school, and who died and fill premature graves. But I do not know of one individual case where I could fairly and honestly say it was due to, and produced by, overwork in school.

10. I have not given this subject enough of thought, or study, to express an opinion.

11. I think not. In fact I think memorizing is not made sufficiently prominent in the schools of the present day. And I regard mathematics as one of the most important studies in schools. I think there is a great deal of humbug and nonsense in this hue and cry against the work children do in schools. I tell you, if you will cry out against the work and exercise, in the open air, out of doors, that they don't do and don't take, at home, you will strike the nail on the head.

12. As a rule, I should say they were not. But I do claim, and we have had abundant proof of the fact in our schools, the specialists do and can teach their specialty with greater success, and with far less mental strain to the children, than others who are not.

*13. I do not think it is. I am quite sure it is not.

14. If we had specialists to teach it, I would. I would say, with I think it was John Stewart Mill, "that the most important education for a child or man is self preservation." Teach them first to prolong their own lives. This, which is most important, and of vital consequences to the individual and race, is either neglected altogether, or taught in a superficial indefinite way toward the last of the boy's or girl's education at school,

I have hastily answered the questions in their order on your circular, as my experience and observation has led me to form opinions. They may be radically different from other observers, but that I cannot help. Such as they are, I give them to you, hoping they may be of service in helping you prepare your article for Sanitary Convention.

There is another subject connected with our schools and educational system, which although not germane to your article, is in my opinion one we must meet in the near future. That is how far the State should carry its free school education. In other words, how much of an education should be given free?

With very much respect,

Flint, Feb. 20, 1882. JAS. C. WILLSON.

REPLY FROM E. P. CHRISTIAN, M. D., OF WYANDOTTE, MICH.

The Wyandotte school is a graded school with about the same curriculum as the average graded schools of the State. I was on the board 12 years and have been the medical attendant of a large proportion of the scholars since its organization. With these preliminary remarks, I will answer the queries in order, to the best of my judgment and belief.

1. *Not too much for the average; of course there are exceptional cases.

2. In exceptional cases, young girls of studious habits and not as well physically organized as the average have doubtless suffered from too much and prolonged application to studies and with not sufficient or careful attention to physical training and habits.

3. To girls, I believe.

4. Not to that exclusively, but to that as one of the causes.

5. Possibly.

6. I think it should not.

7. Only in exceptional cases.

8. Not the precocious, but the diligent and industrious.

9. No general rule as to that.

10. Doubtful.

11. I think not.

12. Not as a rule.

13. The continuous session would be of advantage to many, but I cannot say that on the whole it would be preferable.

14. On the part of the teacher, yes.

Respectfully,

Wyandotte, Mich., Feb. 18, 1882. E. P. CHRISTIAN, M. D.

REPLY FROM JOHN S. CAULKINS, M. D., OF THORNVILLE, MICH.

1. *Yes; in number.

2. Want of thoroughness in what is most needful.

3. Not prepared to answer.

4. Have no cases to report. Children are so elastic that they will bear a good deal of abusing and not show it at the time.

5. It probably is.

6. No; certainly not.

7. Yes.

8. No.

10. Not prepared to say.

11. Too much is required and expected of the memory.

12. No; a specialist is generally one to whom his department came easy and he is apt to think it easy for everybody.

13. A continuous session of five hours cannot be advocated for village schools where many of the pupils have to come 1½ or 2 miles. Such are sure to want their dinner by 12 o'clock, and to go hungry an hour longer would work them an injury. In cities where dinner hours are generally later and pupils have shorter distances to go, the plan may do better. I am decidedly in favor of one session a day, but I would not have it so long—say 3½ hours.

14. Yes.

Besides the overtaxing the memory, children that go to school suffer from bad arrangements about the house, from bad ventilation, bad heating, and bad lighting. The fault may not be always with the house itself. In speaking of the equine race it is often said that there are more balky drivers than balky horses; so we may say there are more faulty school teachers than school-houses. It is pretty common in district schools both summer and winter to employ teachers who are ignorant of even the first principles of hygiene and physiology. Of course, in such a case, nothing better can be expected than to have the laws of health constantly violated at the expense of the poor children.

Yours truly,

Thornville, Mich., Feb. 20, 1882. JOHN S. CAULKINS.

REPLY FROM E. N. PALMER, M. D., OF BROOKLYN, MICH.

In my opinion no subject brought before the Sanitary Convention will be of more practical importance or of more vital interest to the welfare of the people of the State of Michigan than the one on which you are engaged. The fact is, we are running this school business at too high pressure, and a majority of our educators are sitting on the safety-valve, and ridicule every attempt to alleviate the sufferings, nay slavery, of the rising generations. Crowded, ill-ventilated school-rooms fill our land. Children from the age of seven to fifteen or eighteen constantly under discipline more rigid than that of any soldiery under the sun, with tasks that almost any mature mind would break under; with physical systems, that left untrammeled would be in constant activity from morn until night, kept in almost marble-like rigidity. Is it any wonder that our fairest flowers and most precocious intellects drop by the wayside? The fact is I cannot think of the subject without coming to the boiling point. The thing is damnable, and unless a reform is made a majority of people in time will in self-defense resort to private tutors.

Some one has said: "If we would come near to perfection in our human achievement, we must unite the physical with the intellectual; must manage in some way to divide the work between the steam and the engine."

Some years since, in reply to a noted teacher who had been extolling our graded school system to the skies, and at the same time ridiculing the district schools in the country I said this: Prof. ——, as a teacher, ought to know if he does not, that the foreign pupils, most of them coming from the country schools, having had but from four to seven months' schooling in each year, taught by a system which "is a disgrace to the farming community," as a rule stand as high if not higher in their studies than those who have had ten months' schooling under the graded system. If this is true, and it is true as far as my observation extends, there must be a reason for such a condition of things. Cannot it be found in the vital exhaustion occasioned by excessive study, crowded and improperly ventilated school-rooms, lack of physical exercise, and the "school system" on the one hand, and on the other the healthy vital energy, brought into perfection by moderate study, school rooms not crowded, proper physical exercise, and the lack of a school system?

1. *I answer emphatically, yes.

2. A decrease of physical power, and a disproportion between the physical and mental—loss of vital force.

3. In boys up to twelve—probably from the fact that the mental faculties of girls are more mature. In girls from twelve to fifteen.

4. Yes; have three cases of serious illness now, occasioned entirely in my opinion by over-study.

*The numbers beginning paragraphs refer to questions in a circular on page 63.

There has not been a year since I have been in practice but what I have been called upon to treat cases of illness attributable to over-study.

5. Yes.
6. No.
7. Yes—in the precocious.
8. No. They are like hot-house plants.
9. Those who were the most studious.
10. I think so.
11. Yes.
12. No. Specialists and experts are as a rule always astride of a hobby.
13. No. Children are animals that require for their development three hearty meals a day, and up to the age of twelve at least, ought not to be confined in a school-room over two hours at a time, and not more than nine months in the year.
14. Yes. For in that way we may raise up a generation of people that will know something about the science of living. At the present day we pay the doctor for telling us how to live, just as the minister is paid for saving our souls. Very respectfully, E. N. PALMER, M. D.

Brooklyn, Mich., Feb. 21, 1882.

REPLY FROM J. H. JEROME, M. D., OF SAGINAW CITY, MICHIGAN.

1.* Perhaps not, only in exceptional cases.

4. Yes.

6. Certainly not.

7. Regular attendance, when practicable, is very desirable for the benefit of the scholar and school, yet when such rules as referred to exist, a very large and liberal discretion should be vested in the teacher. Ambitious pupils need no terrorizing, and are injured by it. The mental and moral developments of such are usually in excess of the physical, and overpower it under such stimulus. With the stolid it makes no difference.

8. Not as a rule, particularly if manifest at an early age, to be qualified if developed later in their course of study.

9. Good usually.

10. In the primary departments, perhaps not. In the more advanced departments, I think they can and should be. All graded schools should have one purely elective department.

11. Yes, if young.

12. Usually not.

13. A continuous session of five hours should not be tolerated. With liberal intermission mid-way it would be well and afford scholars more time for needful recreation in day-light.

14. These are important branches of an education and not to be overlooked.

Respectfully yours,

Saginaw City, Mich. J. H. JEROME.

REPLY FROM DR. E. L. SHURLY, OF DETROIT, MICH.

1.* No, as a rule.

3. I think it is greater to girls.

4. Not wholly attributable, but partially.

5. I think not.

6. No, if properly accounted for.

7. In some cases.

8. At a guess, I should say, yes, although it is a matter which depends so much upon the accidental circumstances of life.

9. About as many poor as good ones.

10. No.

11. I cannot say.

12. Certainly not.

13. It is not, in my opinion. I favor shorter hours, if anything.

14. I think such studies in public schools do no good whatever.

I am an ardent advocate of our public school system, though I hope, not bigoted. I believe no child ought to be sent to school without his or her condition (physical, etc.,) having been considered by the family physician. I think our profession are getting the hobby of laying too much upon the schools, while they ought to pay more attention to the individual scholar.

The discipline and work of our schools is more moderate than formerly. I believe that some children ought not to be sent to school at all, some, not until 8 or 9 years of age, perhaps, and others sent early,—at 6 or 7 years; while younger children should be placed under the "Kindergarten" system. I can remember when about the age of 12 years to have been studying mental arithmetic, practical arithmetic, elementary algebra, elementary geometry, natural philosophy, physical geography, elementary astronomy, first lessons in Latin, grammar, spelling, writing, drawing, and reading. You have probably had the same experience. It did us very little good, perhaps, except as a matter of discipline. Sincerely yours, E. L. SHURLY, M. D.

Detroit, Mich., Feb. 21, 1882.

REPLY FROM MARY E. GREEN, M. D., OF CHARLOTTE, MICH.

Your questions are before me. I am delighted that school life and hygiene are to receive the attention which you are to give it, and would most gladly give aid to any step which will give more intelligent ideas to school boards. Long since I came to the conclusion that every school board should have at least one intelligent physician among its members, but instead of that, it is cus-

tomary to place too many fossilized relics on the board—men who do well enough for business men, but who are totally inefficient to act in any manner relative to the wants and necessities of the young in schools. They hire teachers who claim to act under the dictation of the board, and it is quite amusing in tracing out certain things in schools, to find it ever a fact that neither teachers nor school board know why things occur nor who is responsible. I refer especially to a matter which I have agitated most earnestly for at least three years, the matter of having recess during morning and afternoon sessions. The schools here had no recess, and several cases came to me for treatment with urinary and rectal troubles, especially constipation and irritation of urethra from retention of urine. My own little girl had trouble, and I came to the conclusion that to keep children in a crowded room, and I may say imperfectly ventilated rooms—for who will refer to perfect ventilation in school-rooms?—I say to confine children in such rooms for even two hours without change of air, without a little exercise that will send the blood on its circulation a little more rapidly is a sort of barbarism that ought not to be tolerated in any land, and would not by physicians. I am happy to state that through my constant efforts recess has been established in the lower grades of the school, while in the higher grades the scholars are kept in the entire morning and afternoon session. I do not think the studies are too many or too hard, but I do know that the young ladies who graduate are not what girls should be when leaving school,—they are pale in countenance and languid in action. I think more attention should be given to the practical study of physiology and hygiene in schools, beginning these studies not as is usually done, when scholars are about to graduate, but in the ward schools. It is more necessary than geography—in fact I would not allow a teacher to come into any school who did not pass examination in physiology and hygiene, to that extent that she could keep the air pure in a school-room. The country is filled with teachers who give so many days a week for so much money—and with that interest ceases—and we should demand the best teachers in primary schools. I hope to hear that the matter of recess in schools will be discussed and settled upon intelligently by your convention.

Yours truly,

Charlotte, Feb. 21, 1882. MARY E. GREEN.

REPLY FROM HENRY B. LANDON, M. D., OF BAY CITY, MICH.

I must confess that my acquaintance with our system of graded schools is not extensive,—never have visited them. But in the course of my practice I have found instances that I thought demonstrated that the pupils were overworked—too many studies resulting in superficial acquirement only. Headaches are very common, especially among the young girls; retarded menstruation, appearing later in life and scantier than one would expect. I have had several cases of chorea that I thought were attributable to overstudy. From inquiry of the patients mentioned, I was clearly of the opinion that too many studies and too prolonged application lay at the root of their troubles. Deficient ventilation, too, is undoubtedly a factor in producing disease among the school children. I am sorry that I cannot contribute anything of value to you for your paper, never, as I said before, having made an investigation of the practical working of our school system, but only drawing inferences from isolated cases that have fallen under my observation.

Yours respectfully,

Bay City, Feb. 21, 1882. HENRY B. LANDON.

REPLY FROM W. R. MARSH, M. D., OF BAY CITY, MICH.

1. *Too many.
2. Confusion.
3. Alike.
4, 5. No.
6. No; for poverty, indolence of parents are at fault.
7. Yes.
8. No.
9. Do not know.
11. Yes.
12. Experts are egotists.
13. Two sessions are better.
14. Hygiene is good, but physiology just fits an egotist for a quack.

As our children are not to become pills when finished, I think they should not be run through a machine.

Respectfully,

W. R. MARSH, M. D.

REPLY BY C. B. GILBERT, M. D., OF DETROIT, MICH.

My answer to your questions, I regret to say, must be rather conclusions from a few cases than many observations.

1. *I think too many for some scholars in the same class.
2. Two great a strain upon the nervous system.
3. Much depends on the temperament; girls most liable.
4. None.
5. In many cases no doubt.

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*The numbers beginning paragraphs refer to questions in a circular on page 63.

6. I think not, if, as you say, "properly accounted for."

7. Beyond question it is so.

8. Inferentially not always, nor likely to be so.

9. I do not see how it is possible they should be good scholars.

10. Studies should always be elective and adapted to the future requirements of the pupil; rigidity and marked examinations should be very discriminative. The scholar, not rules, nor discipline, should be the end.

11. I am not positive about this; but memorizing is not the best way to teach, nor at all, if at the expense of first principles.

12. They are not; they are too one-sided.

13. The "five to eight-hour" plan is the best.

14. I would most decidedly, and enough anatomy to make physiology intelligible.

Yours very truly,

Detroit, February 23, 1882. C. B. GILBERT.

REPLY FROM DR. H. C. WYMAN, PROFESSOR OF PHYSIOLOGY AND HISTOLOGY, MICHIGAN MEDICAL COLLEGE, DETROIT, MICH.

In reply to question 12, "are specialists or experts in any department of learning fair judges of the difficulty with which children of different ages, temperaments, tastes, and abilities, can acquire that special kind of knowledge," I answer no. Permit me to give my reasons. Specialists in educational matters are rarely experts in medicine, and are therefore ignorant of the signs and conditions by which a physician recognizes the fact that a child will break down in health if a certain system of training is pursued. They study the work accomplished by their pupils, and are not presumed to consider the wear and tear in bodily health by which the work is obtained, Every school should have its medical officer, whose authority on all questions of health and hygiene should be supreme.

In reply to question 14, concerning the study and practice of physiology and hygiene, I do not believe the average school teacher is qualified to teach those subjects as they deserve to be taught. I would advise that more attention be given to the practice of physiology and hygiene. and that less be given to the study of text books upon those subjects. I believe in popularizing those sciences, but it will be a long time before others than physicians can teach them correctly. Regret that I have so little time to devote to the interesting and pertinent questions you have submitted. I am respectfully yours.

Detroit, Feb. 23, 1882. HAL. C. WYMAN, M. D.

REPLY FROM J. H. KELLOGG, M. D., OF BATTLE CREEK, MEMBER OF MICHIGAN STATE BOARD OF HEALTH.

Your circular of Feb. 14th received. Am very glad that you have undertaken an investigation of the subject named in your circular, as I feel sure it is one which admits of the most earnest attention of sanitarians. I will answer your questions in the order in which they are asked in your circular as follows:

1.* I believe that the amount of work required of students in our public schools is, as a rule, too great for the average age of the students, not only in the number and character of studies pursued, but in the amount of ground covered in the several studies.

2. In my estimation the present course pursued in most of our public schools inevitably results, in a great majority of cases, in one of two things: either the student's physical or mental health is endangered, or his educational training is rendered, to a great degree, superficial. This I observed well myself when a teacher; and since, viewing the matter from a physician's standpoint, I have become thoroughly convinced that the present educational system is, in this particular at least, very faulty.

3. As rule, I think the injury is greater to girls than to boys. My reasons for thus thinking are chiefly as follows:

(*a*) Girls are more liable to injury from greater delicacy of constitution, and especially on account of the critical change, which occurs in them at an earlier age than boys, and which is accompanied by a more profuse disturbance of the vital economy in them than in the other sex.

(*b*) Young girls are, as a rule, more studious than young boys, and are more profoundly influenced by methods which are usually appealed to by teachers to secure proficiency in study.

(*c*) Girls do not, as a rule, derive the advantages from vigorous out-of-door exercise which are enjoyed by boys.

4. In my practice (which is chiefly confined to chronic diseases), I have met with a large number of cases of nervous and uterine diseases in young women in many of which these maladies were clearly traceable, in some degree at least, to overwork in school. In most cases there were also other causes which had contributed in some degree, to occasion a breakdown in health; but most of these were such as might have been, to a considerable degree, avoided, had there been less crowding and confinement in connection with the school work.

5. I believe promptness and regularity in attendance is necessary to the maintenance of a good interest in any school.

6. I do not believe that absence on account of sickness, or for other reasonable cause, should appear to the discredit of a scholar, any further than it renders him less proficient in scholarship.

7. I believe there is a marked tendency to over-stimulation and disproportionate development of the nervous system, or at least of certain parts of the brain, which are decidedly prejudicial to the mental and physical health.

8. As a rule, I have observed that precocious students are not the most prominent in practical life after their school career is concluded. But I have known of a number of precocious students who have been quite as prominent in practical life after leaving school as any other class during their school days.

9. Of those broken down in health during school work, under my observation, some have been excellent scholars. I cannot say what the rule has been.

10. I think examinations should be rigid as to the central ideas involved in the studies pursued, but believe that, as a rule, examinations are very defective on account of their formality. I think there is great chance for great improvement in the methods of examination. I believe there is great advantage in having certain studies elective in the latter year of study, after the student has become sufficiently mature to make him, to some degree, competent to judge what is best for him.

11. I believe that too much attention is given to the details of history in many instances, and that injury is done by teaching higher mathematical branches to children who are not sufficiently mature in age to receive that kind of instruction with profit.

12. No.

13. I think short sessions are more profitable than long ones for children.

14. By all means.

Yours truly,

Battle Creek, Feb. 19, 1882.

J. H. KELLOGG.

REPLY FROM L. C. WOODMAN, M. D., PAW PAW, MICH.

1. *No.

2. Not any.

3. Neither.

4, 5. No.

6. By no means.

7. No.

8. No; the scholar's success in after life depends upon his application to business or study.

9. Good, but hard workers in order to be good scholars.

10. Yes.

11. No; unless language of author is to be remembered.

12, 13. No.

14 More to the practice of hygiene, less to the study of physiology.

These answers are supposed to relate to healthy children.

L. C. WOODMAN, M. D.

REPLY FROM JOHN P. STODDARD, M. D., OF MUSKEGON, MICH.

1. *Yes.

2. Nervous irritability, imperfect sleep, loss of appetite, resulting in the general impairment of the system.

3. With girls, I believe.

4. I have.

5. Yes; decidedly.

6. No.

7. I think so.

8. Not generally.

9. More often the best.

10. I certainly think so.

11. I think the general tendency is that way.

12. No.

13. As I understood you, no.

14. Yes.

In regard to question No. 1, I feel that the general tendency among our so-called "advanced educators" is very decidedly towards pushing and over stimulation. If a scholar is bright and quick he is advanced too fast and is soon overworked. Teachers are too apt to look at their success in advancing pupils as a part of their "stock in trade," rather than their success in getting the esteem and good will of their scholars.

As regards question No. 13, I think if there could be a recess of 30 minutes that the one-session plan would be the better for the more advanced pupils, but for the younger scholars I think two sessions of 2 or 2½ hours to be the more preferable—with plenty of recesses at that.

Generally, I wish to say on the matter of discipline, I think there is far to great strictness and rigidity. Too much military, too much going up stairs with the arms folded behind the back, insisting on too much quietness in the school room, too little freedom for small and nervous children to change positions, too little freedom for pupils to leave their seats and the room at calls of nature. In short, I think there is a too strong wish and effort with teachers to run the school as a "machine" or military drill and leaving too little freedom and spontaneity to the child.

Yours truly,

JOHN P. STODDARD, M. D.

Muskegon, Mich., Feb. 24, 1882.

* The numbers beginning paragraphs refer to questions in a circular on page 63.

REPLY FROM SAM'L P. DUFFIELD, M. D., PH. D., OF DEARBORN, MICH.

1. Too much in both.
2. Emaciation, loss of regularity of bowels and appetite, nervous depression.
3. Greater to girls.
4. In girls, several cases of cessation of menses, and one resulted in phthisis.
6. No.
7. Yes.
8. No.
9. Been hard (good) students.
10. Yes, more practical.
11. In my opinion, yes.
12. I think not. They were never put through the course as rapidly, but it took years for them to accumulate the knowledge which they strive to force upon these in a few months.
13. Session should be from 9 o'clock to 12 A. M., from 2 to 4, P. M.
14. (1.) I object to the study of physiology in mixed classes—girls by themselves and boys by themselves, for moral reasons. (2.) Hygiene certainly should be studied.

There is one article which I do not see in the paper, and that is the constrained position for so long a time without any chance to alter it. Also the fact that often rigid teachers refuse children or scholars the privilege to go out except at recess to defecate or urinate, assuming that recess is the only time for it. In this I know they are wrong, and can cite cases of bladder difficulty and cystitis arising from such a course of drill.

Yours truly, SAMUEL P. DUFFIELD, M. D.

Dearborn, Mich.

REPLY FROM MORSE STEWART, M. D., OF DETROIT, MICH.

1. *Yes, for a slow child, even if he has good intelligence.
2. Discouragement and distaste for study.
3. Cannot say.
4. Know several cases where slow minds became bewildered, and sickness ensued.
5. Yes, in the spring months.
6. It does do so, though it is felt by the teachers to be unfair in cases of illness.
7. With girls sometimes.
8. Occasionally.
10. Most certainly, yes.
11. Yes.
12. No; a teacher being so seldom willing to learn anything by another person's experience or observation.
13. Two sessions are less of a strain in the long run.
14. There is quite sufficient superficial study of this sort already, and any other is not to be hoped for.

Would certainly recommend more common sense in the adaptation of rules, methods, and systems to the individual case. Mechanical teaching of herds and droves never insures a well balanced education of the brain, or even a well balanced brain. A bright, industrious boy or girl comes out with a mind stored, aye, crammed, with facts that he does not know how to use. I cannot but believe that the powers of thought are stultified by the mechanical powers of memory. This is especially true in the arithmetical processes of the day.

Yours respectfully,

Detroit, Mich. MORSE STEWART.

REPLY FROM LEARTUS CONNOR, M. D., OF DETROIT, MICH.

Having been almost exclusively engaged in practice in cases relating to the eye and ear for several years, I have been unable to see many cases of disease involving other organs. But I have observed many and severe injuries to the eye and ear, in cases of children attending our city schools. Asthenopia arising from defective refraction is very common. These defects of refraction increase with the continued attendance of the children upon school. From my observation of the cases, I am convinced that the conditions attending school life are such as to tend to the rapid development of these defects after they are begun, and even to begin them *de novo*. These conditions are multiform. Some of them I may mention. (1) Bad air. (2) Bad light. (3) Too long continued fixation of the eye upon near objects. (4) Bodily exhaustion of a general nature from an attempt to do too much under unfavorable conditions. (5) Special exhaustion of the entire nervous system. The eye and ear troubles seem simply to indicate a defective general mal-nutrition following in part the causes mentioned above and in part violations of the laws of health at home and out of school. (6) The too early entering of the pupil upon the training of the schools. It seems to have been overlooked by our educators, that the powers of endurance of a child of eight years are less than one of twelve, and still less than one of twenty-one years; hence they as a rule keep them in school an equal length of time, to the great detriment of the younger children. This leads me to state what seems to me the fundamental mistake in the whole matter: The failure to individualize the separate scholars; they are trained by wholesale, instead of one by one. Instead of making the training suited for each individual, they are sorted out in groups according to age, etc., and put through by wholesale; if the child breaks down under the load

that another carries easily, that is a dispensation of Providence. I would advise the increase of teachers until no one would have a class larger than a dozen. Further, I would give her the fullest liberty, making her responsible for the health of the children as well as for their progress in book-learning. Any failure of physical health of any pupil should lead to a full investigation of its causes, and when once ascertained, these causes should be removed. I fully believe that the higher grades of schools do more harm than good to the future prosperity of the pupils. In the lower grades the damage is not so apparent as the strain is not so long continued. I object to all wholesale, ready-made, machine-training of children, and insist that it does infinite damage. All suggestions for the relief of single defects are but stopping the spigot while the bung-hole is left open. But you say the multiplication of teachers costs so much. True, but is it not better to shorten the course, and make that which we do have such as will make good, capable citizens. I know of lots of human wrecks from our present system,—wrecks of eyes, of brains, of bodies. It makes me sick to think of what they might have been had not the machine schools of the present day crushed all the life out of them. But machine politics is greater than any few individuals, and the car of destruction still rolls on. I hope your discussion may do something to make its course less destructive, but I can scarcely hope that it will stay its progress. If I have succeeded in making myself understood I have answered your inquiries.

Very truly yours,

Detroit, February 24, 1882. LEARTUS CONNOR.

REPLY FROM JOHN BRADY, GRAND RAPIDS, MICH.

1. *No.
2. None.
3. To girls.
4, 5, 6. No.
7. Yes.
8. Not generally; occasionally they have.
9. Usually good.
10, 11, 12, 13. No.
14. No; I would abolish both.

I have a word to say in relation to the construction of schoolhouses in a city like this, that has an area of nine square miles, and a population of thirty-two thousand. In the first place, schoolhouses should not exceed two stories in height; they should be centrally located in the districts they are to accommodate, and be constructed, for the sake of the pupils, on the best hygienic principles known. I disapprove in toto the policy and principle of building large houses, three or more stories, and crowding them with pupils, in many instances from remote parts of the city. It makes it a hardship for the scholars to attend. The high or central school in this city is one in point. It is too far from some of the pupils; to others it is accessible only by climbing 150 feet of hill, besides three flights of difficult stairs, before reaching the entrance to the first floor. Then the highest grade pupils, boys and girls, have to ascend three flights to their class-room; all of which is, undoubtedly, prejudicial, to say the least, to the health of the girls, most of whom are women or passing into womanhood.

Respectfully,

JNO. BRADY.

Grand Rapids, Mich., February 20, 1882.

REPLY FROM ARTHUR HAZLEWOOD, M. D., OF GRAND RAPIDS, MEMBER MICHIGAN STATE BOARD OF HEALTH.

Your circular of 14th inst. is at hand. My opinion only is vouched for in the following answers, numbered to correspond with your circular.

1. *Too much, both in number and character.
2. Incompetency; the studies are not mastered, only crammed. Physically, impaired health—evidenced by frequent headaches and nervous exhaustion.
3. To girls.
4. Think I have.
5. Yes.
6. No.
7. Yes.
8. No.
9. Fairly good.
10. Think it can.
11. Am not positive, but think our whole school system of studying is too much memorizing from the book—for recitations.
12, 13. No.
14. Yes.

Respectfully, A. HAZLEWOOD.

Grand Rapids, Feb. 18, 1882.

REPLY FROM EDWARD COX, M. D., OF BATTLE CREEK, MICH.

1. *Too many studies are required.
2. Loss of physical development.
3. Girls.
4. Yes. One of my own sisters died in consequence.
5. It is.
6. No.
7. Yes.
8. No.
9. Good.
10, 11. Yes.
12. They are poor judges.
13. No.
14. Yes, but a little learning is a dangerous thing. Make it thorough or not at all.

Respectfully, EDWARD COX.

* The numbers beginning paragraphs refer to questions in a circular on page 63.

REPLY FROM O. MARSHALL, M. D., OF LANSING, MICH.

For a number of years I was a member of the Lansing Board of Education. The last two years (1878-9) of such membership I served as chairman of the committee on course of study and text books. Many of the questions propounded in your circular were considered by the committee and acted on by the board. Radical changes were made in the method of teaching in the schools at the time, and are still on trial. Among the changes made were the dropping of primary, intellectual, and rudiments of written arithmetic, and substituting one primary book in their stead, oral exercises by the teacher taking the place of studied lessons from the books. All books on geography were dispensed with in the primary grades, and oral teaching substituted. Changes were also made in text books on grammar to conform with the plan of oral instruction. Other changes were made throughout the course to make it as practical as possible. This plan of teaching has been on trial in our schools for the past three years. I believe it has been satisfactory. The greatest difficulty has been encountered in obtaining teachers properly educated for the work.

My answers to your questions are as follows. Lack of time prevents me from writing with that care which is desirable.

1.* Yes; both.

2. Injury to body and mind, and several deaths.

3. To girls.

4, 5. Yes.

6. Not if the reasons are good.

7. Yes.

8. No.

9. Those trying to be good scholars.

10. Yes. In the Lansing high school the studies are elective; but no student can graduate without having completed the full prescribed course. Below the high school grade the studies are not elective. I believe this is wrong. The parents should have a voice in the selection of studies for their children. However, this is a delicate and difficult question to decide.

11. Yes; decidedly so.

12. Probably not.

13. No.

14. Yes, if properly taught.

Respectfully yours, O. MARSHALL.

Lansing, Mich., Feb. 22, 1882.

REPLY FROM J. ANDREWS, M. D., OF PAW PAW, MICH.

1.* Not in our schools.

2. No bad effects.

3. I have observed no difference.

4. I have not.

5. No.

6. Well, sometimes.

7. No.

8. They have.

9. Generally good.

10, 11. Yes.

12. Not often.

13. No, by no means. Our schools have, for the small children, a forenoon and afternoon session of 2½ hours, which I prefer to a continuous five hours' session.

14. Physiology and hygiene are beyond the reach of ordinary school children.

Respectfully, J. ANDREWS, M. D.

REPLY FROM D. W. C. WADE, M. D., OF HOLLY, MICH.

From my own observations I am unable to answer all of your inquiries, hence I will not undertake it seriatim, but will give you my views as they occur to me. I believe I have never known an instance of injury from overwork in school. I am in favor of making school discipline thorough, and am inclined to oppose the tendency of the present that seems to be pervading all departments of education inside and outside of institutions of learning, to lower the standard of mental culture.

Many of the plans and absence of plans of ventilating school rooms are simply abominable. There appears to be no practicable method of furnishing an equable temperature and at the same time a pure air except by means of a furnace, or the indirect method of steam heating.

I have several times been obliged to take young ladies from school on account of the injurious effect upon them, produced by climbing several flights of stairs. Girls before puberty are much better able to reach the higher rooms than after that period, and such an arrangement ought always to be adopted. In answer to question 13 I should say, No. To 14 I say, Yes, for the subsequent benefits to be derived.

I have never known a school board that was not essentially ignorant, and hence incapable of introducing the reforms that the investigators present. Yours,

Holly, Mich., Feb. 20, 1882. D. W. C. WADE.

REPLY FROM G. W. TOPPING, M, D., OF DE WITT, MICH.

Your circular of inquiry in respect to school work in graded schools and its influence upon the scholars has just been received, and I will reply briefly though not seriatim to each of your topics of inquiry. DeWitt has a graded school of three departments, and I have had the honor to be a member of its board of trustees for about twenty out of the last twenty-five years. Said school has not often been accused of requiring too much of its pupils, either in their recitations or discipline. During the twenty-eight years with which I have been intimately acquainted with said school I can only recall three or four cases of sickness in which overwork in said school was be-

lieved to have been causative of said sickness; and in these cases the school regimen could not be held responsible therefor only so far as it was an incentive to the spirit of emulation among the pupils causing voluntary overwork.

In reply to question No. 3, I will say that the school girls who have come under my observation have endured the curriculum of the graded school quite as well as the boys, and owing to their more steady attendance, or for some other reason, their average scholarship has been rather better than the average of the boys. Do not think the requirements of the schools as likely to result in serious injury to a girl's health as is indulgence in many of the (so-called) elegant and refining influences sought to be imparted to them by social life and festive recreation.

6. Do not think that necessary absence of a scholar should discredit him farther than it evidences his loss of opportunity to acquire a knowledge of the recitations had during such absence.

8. No. Mere scholars as such have seldom maintained the lead in any practical avocations in life. The leaders in most practical pursuits have been those who were early trained in said pursuits or avocations, and whose mental endowment or early training had developed in them that indefatigable perseverance upon which, more than any other quality, success depends.

9. A large majority of my young acquaintances who have "broken down in health" have either been poor scholars, or at least they were not pre-eminent in scholarship. This seems to be merely another way of saying that my acquaintance has embraced many more poor scholars than good ones.

11. Think that with the younger classes such studies as grammar, geography, and all except the most elementary principles of mathematics might well be dispensed with or deferred, and the time usually given to them be devoted to the natural sciences, such as botany, lithology, ornithology, etc., taught by object lessons so as to make them attractive and impressive. A child can as easily be taught to give the correct name to these natural objects as to call them all flowers, stones, and birds.

13. Think a forenoon and afternoon of three hours each preferable to a continuous session of school for five hours. Think a continuous session of five hours more exhaustive than an interrupted one of six hours, provided the noon recess be not less than from one hour to one and a half hours.

14. I would certainly think it advisable that more attention be given in the schools to the study and practice of physiology and hygiene. Health is the first requisite of success in any pursuit in life, therefore its preservation is worthy of first attention. Respectfully,

De Witt, Mich., Feb. 19, 1882. G. W. TOPPING.

REPLY FROM GEO. HOWELL, M. D., OF MACON, MICH.

1. *Not too much in number, but too long.
2. Breaking the Sabbath to get lessons.
3. To girls.
4. Have seen cases of protracted nervous affections, coming on while at school, supposed to be attributed to overwork and excitement.
5. Yes.
6. No. Scholarship should be the basis of marking.

7, 8. No.
9. Poor scholars, but ambitious.
10. No.
11. No, I think not.
12. I think not.
13. No. The present system is preferable.
14. Yes, and less to higher mathematics.

Yours, GEO. HOWELL, M. D.

Macon, Mich., Feb. 24, 1882.

REPLY FROM JOHN KAPP, M. D., OF ANN ARBOR, MICH.

1. *Yes.
2. Causes nervous prostration.
3. Greater to girls.
4. Yes.
5. It is decidedly so.
6. It should not.
7. Yes, marked.
8. No.
9. Good.

10, 11. Yes.
12. No, they are not.
13. No, two sessions are preferable.
14. Yes.

Very truly, JOHN KAPP, M. D.

Ann Arbor, Feb., 1882.

REPLY FROM DR. MILTON CHASE, OF OTSEGO, MICH.

Imperfect warming and ventilation of school-houses—ignorance of teachers in hygienic practice and teaching—disproportionate height of seats and desks (tending to cause spinal curvature)—failure, especially with girls, to secure regular evacuations of the bowels and bladder, and consequent tendency to cystic derangements, and habitual constipation—also, lack of sufficient underclothing; these various causes cut down the supposed injuries from over-study, but do not do away with statements in answer to Nos. 1 and 2, *i. e.:* "too many studies in number, and pupils hurried alone too fast," causing among other ill effects, "nervous exhaustion, resulting in impaired digestion, disturbed sleep, and development of inherited dyscrasia."

*The numbers beginning paragraphs refer to questions in a circular on page 63.

REPLY FROM W. W. JONES, M. D., OF TOLEDO, OHIO.

1.* In a few instances only has it been so.
2. Nervous prostration and headache.
3. Greater to girls.
4. Only a very few.
5. Yes.
6. No.
7. Yes.
8. No.
9. Good.
10. Yes.
11. Probably not.
12. No.
13. I think not.
14. Most certainly.

There are some other questions not embraced in the catalogue which are fully if not more important. The question of water-supply and daily disinfection of privy vaults for primary school houses is probably the most important of any other. The general apathy and inattention given to this subject has cost the State more lives, and parents more anguish, than any other connected with school hygiene. In this city we traced a local epidemic of diphtheria directly to this source, not long ago; and my observation has led me to conclude that this is the cause of most of the cases of what the older writers have termed "Remittent fever of childhood," but which most modern ones term "typhoid," as it occurs in children of school age.

Yours sincerely,

Toledo, O., Feb. 20, 1882. W. W. JONES.

REPLY FROM E. H. VAN DEUSEN, M. D., OF KALAMAZOO, MICH.

My professional relations have been such that the general subjects covered by the inquiries in your circular of the 21st inst. have not come under my direct observation. Cases of serious functional disorders of the nervous system have been under my care from time to time, which could have been prevented had those directing the education of these patients given proper consideration to their peculiarities and temperaments, and more fully appreciated the importance of symmetrical development. Very sincerely yours,

Kalamazoo, Mich., Feb. 22, 1882. E. H. VAN DEUSEN.

REPLY FROM C. T. SOUTHWORTH, M. D., OF MONROE, MICH.

1.* Not in number; in character, yes.
2. Inability to learn and retain; of no benefit, but involving the principles of cramming.
4. No, not in healthy organizations.
5. No.
6. No, never. I think the teacher's business is with those present only; nothing to do with those out of school or absent.
7. No.
8. No, they never do.
9. Perfect organizations do not break from studies required.
10. Yes.
11. Physiology, etc., yes.
12. No; such are devoid of elasticity and comparisons of mental structure.
13. No.
14. I would abolish both from the curriculum. The small doses of these subjects, learned in our graded schools, are of no value, either in the present or future, to the pupil.

I will say that you may mention in your paper the absurd and irrational architecture of our school buildings, sacrificing comfort, convenience, and the health of the female scholars, and in many instances of the male also, to external beauty and ornamentation of the buildings. The great defect lies in their height. In this country which is comparatively new,—land suitable for sites of school buildings cheap,—the basal structure should be larger, so that the buildings would never exceed two stories in height. The same furnished with stairways easy to ascend, wide steps and low risers, without crook or turn in them. I would then have the scholars divided, so that the smaller children and the larger girls, or those approaching puberty, occupy the rooms on the first floor; the girls ranging from 7 to 11 years could with propriety, if necessary, occupy a room on the second story. My observations prove that the climbing of the stairs is the chief cause of the aches, pains, etc., most commonly complained of by school children. Another topic of importance is that all school buildings should be furnished with ventilators in the walls or chimneys to be opened or closed at will, without trouble, thus avoiding the raising or the lowering of windows in the school room during its occupancy by the scholars—as well such frequent attacks of quinsy, influenza, pleurisy, etc., including headaches, stiff necks, etc. If the Board of Health could effect this change, and have it regulated by law, it would ever merit praise and thanks from all the people, and it would also be one of the most meritorious acts performed by said Board since its establishment. I have no fault to find with the curriculum generally adopted for and in our schools, except the introduction of physiology and the little attention given to chemistry. The first should be excluded, the latter should be given more attention. History should be studied and read in classes, and in recitations the scholars should not be called upon to repeat verbatim et

literatim the language of the books, but to give in their own language the contents of the lessons, impressing upon their minds events, descriptions, etc., without the strain required to commit the language to memory.

You have here in brief my views as to the most important changes in our schools, and please make such use of them as you may see fit. Yours respectfully,

Monroe, Mich., Feb. 24, 1882. CHAS. T. SOUTHWORTH.

REPLY FROM MRS. S. HARTLEY, M. D., OF ANN ARBOR, MICH.

1. *I think that for the average of the scholars, the work in the graded schools is too much. The lessons given are too long, and a scholar's head is just crammed with a little of everything, and he has no correct knowledge of any one subject.

2. It will produce head-aches, congestion, depression, and nervousness; and in many instances cause the scholar to give up school and study entirely.

3. The injury is greater to girls on account of the climbing of stairs. I think it advisable to use elevators if possible.

4. I know of one case especially—of a young girl of Adrian who graduated at 17, and died at 19 from over-study.

5. I think not.

6. No. If a scholar has been prevented from attending school, and is properly excused, it should not count against him.

7. To a certain extent. Over-stimulation of the nervous system, and too little development of the muscular system, is one of the causes of female weakness in after life.

9. Mostly of good standing.

10. The course of study would be more adapted to a scholar's liking if more elective.

12. No.

13. A forenoon and afternoon session is preferable.

14. Question 14 is, in my opinion, the most important. These studies have for many years been neglected, and it would be far better to lay aside some of the other studies, and take these.

REPLY FROM DR. B. H. FAIRCHILD, OF POMONA, CAL.

1. *Yes. Too much forcing.

2. It is difficult to answer this question,—the "ill effects" may be of so varied a character—modified by heredity as well as acquired abnormal conditions. It is safe to assert that anything which tends to overtax the mind unduly debilitates the nervous system, and the nerves (not the blood, as the bible says) are the life of the child and future man.

3. The former.

4. We know that unnatural conditions produce unfavorable results.

5. Yes.

6. No.

7. Yes.

8. "Precocious" pupils are frequent failures.

9. "Good," as a rule.

10. Why not?

11. Undoubtedly.

12. "Specialists or experts" are inclined, as a rule, to over-tax the physical, that the mental may show forth their works.

13. The latter is preferable on account of the intermission.

14. Yes.

REPLY FROM DR. C. GEORGE, OF ANN ARBOR.

I have on several occasions observed nervous diseases of a grave nature assuming specific types, which had yielded to proper physiological rest, and reappeared after the scholar had again resumed full work at school, and proper rest again restored health. In my opinion, our schools demand too much and too varied work for a brain as yet in process of development, even for our strongest and most robust scholars; and in those of weak or sickly constitution—who are nevertheless obliged to keep abreast with the strongest—this strain often proves too much both for body and mind. * * * * *

REPLY FROM PROF. W. H. PAYNE, OF THE UNIVERSITY OF MICH., ANN ARBOR.

1. *It appears to me that too many subjects are included in the ordinary school course. Intention is sacrificed to extension. It is better in all respects to know a few subjects well than to have a smattering of many subjects. The high school is chiefly affected by this multiplication of subjects.

2. I have not observed that the evil I have mentioned has any marked effect on the health of pupils. It chiefly affects the quality of the education given.

4. In my experience a serious illness caused by overwork in school is an extremely rare occurrence. The schools are charged with evils that have their origin at home,—as in late hours, improper food, etc., etc.

5. In general there is not undue rigor in the matter of attendance, though the wants of excep-

* The numbers beginning paragraphs refer to questions on page 63.

tional cases may be sometimes overlooked. Special arrangements should be made for pupils in delicate health. With proper lighting, warming, and ventilating, there need be but very little danger from the regular attendance required by all efficient schools.

6. Absence properly accounted for is a fact that must be noted, but it need not affect the credit of the pupil except so far as it interferes with his progress in his classes. A pupil who may be absent a third of his time from illness cannot expect to keep pace with his rugged classmates. This is a result for which there is no remedy.

7. As a rule, I do not think pupils are suffering from over-stimulation; though I hold that pupils are sent to school at too early an age, and that in consequence the pupils of the lower grades are sometimes taxed beyond their powers. It would be better if children were not admitted to school at an earlier age than seven. Children below this age should be subjected to no severer mental strain than that which the kindergarten requires.

8. Precocious pupils are the dread of the wise teacher, but the pride of fond parents. They ripen early, but do not become strong.

10. Class work and examinations are not too rigid for pupils in good health and of proper ages Any marked relaxation in either respect would soon cause a general complaint by parents. A pupil in feeble health ought to take more time for his course, doing one year's work in two. Such pupils are the exception, and they should not determine the rule for the many.

11. As a rule, the memory is not taxed nearly so much as in the olden school; for some years it has been a neglected faculty. It is possible that the science of arithmetic may be taught to children at too early an age; though in most schools this phase of the subject is not taught at all.

12. Undoubtedly teachers of special subjects who have acquired their knowledge with unusual facility often underrate the difficulties that beset the ordinary pupil.

13. It appears to me that a continuous session of five hours is very unwise, though I cannot speak from personal experience.

14. There should be a larger study of physiology and hygiene in all our schools; and a competent knowledge of these subjects should be required of all teachers. Very respectfully,

Ann Arbor, Feb. 18, 1882. W. H. Payne.

REPLY FROM MRS. A. F. KINNE, OF YPSILANTI, MICH.

Yesterday morning my husband suggested that I answer your paper. I declined on the ground that I had not made the subject a sufficient matter of study. But upon reflection, it occurred to me that there was a side coming from observing parents at home which you would fail to get a glimpse of, if only educators and experts answered the questions propounded.

The school of which I know the most is the Central school of this city, of some eight hundred pupils. It may probably be considered a fair type of all our city schools. The sessions are three hours in the forenoon and two and a half in the afternoon; no recess during either session.

I speak from the standpoint of a mother, who has followed the progress of two girls, regular attendants from the first grade up to the high school department. These children upon whom I base my observations, are of average health, not over vigorous nor yet weaklings. After repeated trials, I found they never finished a term with the regular routine of work and school hours without breaking down more or less, and so I learned to ask for a shortened session for them, and an omission of one at least of the regular studies. I found on that plan they stood school life very well. I am very sure of one thing, viz.: that the work in all grades up to the high school should be so arranged that pupils could finish their tasks in school hours proper, without carrying home a bundle of exercises and problems to fill out the evening.

I was a teacher myself long enough to learn that it is as important for the pupil as for the school that "the discipline should be exacting in its requirements of attendance."

I think the change "to a continuous five hour session from eight to one," would prove a poor one. As a rule, children eat hurriedly in the morning, and so their breakfast is a light meal; and they need an earlier dinner than they usually get rather than a late one.

In regard to "the study and practice of physiology and hygiene," we find the study in most schools, but we miss the practice, and the result is that children enter the lower grades straight, erect as nature made them, and they come out from the higher grades more crooked than they should be at the age of forty. No amount of teaching at home can counteract that continuous sitting in a wrong position at school. Yours truly,

Ypsilanti, Feb. 24, 1882. Mrs. A. F. Kinne.

REPLY FROM MRS. F. K. OWEN, OF YPSILANTI, MICH.

Your circular was handed me with a request that I would send you some "views" on school hygiene. I have formerly taught school and (perhaps not unprejudiced) consider that school work is not the sole guilty cause of unhealthy students. I take the liberty of sending to you some opinions on the subject, but I shall not be at all distressed if they are unavailable to your purpose.

1. * In the generality of cases, no.

4. Yes. Some years ago almost every member of one graduating class in the State Normal School

had some illness after leaving school, due to the rigid and exacting study. The present system of instruction in the Normal School (in my opinion) will not injure any student by over-work.

5. In the case of young pupils, *i. e.*, under 12 years—tender and timid children frequently suffer from a nervous terror of tardiness and absence.

6. No.

7. No, not from legitimate school work.

8. The leading scholars of a class are, if healthy, usually prominent in after life.

9. Failing health as often appears in dull scholars as brilliant ones.

10. Yes.

11. Not as a general thing.

12. If they have good common sense they are better judges than those less familiar with their specialties.

13. With older pupils, *i. e.*, over 16, one long session or attendance only at recitation is preferable, but with young children short sessions and recesses are best.

14. Yes.

It is undeniable that very many children and young men and women become unhealthy while attending school, but the causes of this may be found not in a faulty course of study but in collateral circumstances. Of these may be mentioned:—

(1.) Bad ventilation. In the elaborate and expensive union school buildings in the State impure air is the rule and not the exception. This results either from improper construction of the building or from a costly and complicated system of heating and ventilation being in charge of an ignorant or negligent janitor.

(2.) Climbing flights of stairs is injurious to girls. The dress of young women makes the muscular exertion of climbing stairs much greater than that of men. It might be an excellent idea to array architects and building committees in the complete panoply of feminine attire and walk them up and down a three-story edifice with ceilings 15 or 20 feet high.

(3.) Insufficient air space. Rooms should be wide and low rather than narrow and high. It sometimes appears that architects consider a room 40x50 and 20 feet high equal to one 50x80 and 10 feet high, as the space is the same; but the latter has much more available air. It is lateral rather than vertical space that gives breathing room.

(4.) Perhaps the most fruitful source of failing health in students is lack of suitable eating and sleeping. Students who attempt to do the work of school cannot also devote frequent evenings to late hours at entertainments, and something must give way, either lessons or health.

In the matter of eating there is room for much improvement. It is proverbial that pupils come from school "hungry as bears," but it does not always follow that they are immediately supplied with food. They must usually wait till some established hour for dinner or supper—an hour established not for the convenience of the working children but for the convenience of some working adult, or perhaps for the indulgence of some who do not work at all. In few families is it considered important to have a meal ready when scholars return from school. It is often that scholars snatch a hasty and half-masticated meal both at breakfast and dinner, constantly listening for, and dreading, the "first bell," or perhaps cut short by the "last bell."

With older students in high schools and colleges with long sessions and early recitations, it is usually the case that a scanty and hurried breakfast, often with "clubs" and self-boarders, a "cold bite" only, is the only morning meal. It will be found that most of the scholars who "break down" are of those who do not eat and sleep sufficiently. It is of the first importance that industrious students should begin the day with an ample, nutritious, and leisurely breakfast It may be added that the health of many teachers also fails from these same causes.

Very respectfully,

Ypsilanti, Feb. 23, 1882. MRS. F. K. OWEN.

REPLY FROM R. A. EVERETT, M. D., OF HILLSDALE, MICH.

1.* Yes; as to number and character.

2. Neurasthenia and general prostration.

3. Girls; so my experience points.

4. Yes; of serious prostration.

5. Yes.

6. No.

7. Yes.

8. No.

9. Good scholars.

10, 11. Yes.

12. No.

13. I do not know; never saw it tried.

14. Yes.

Respectfully,

R. A. EVERETT.

Hillsdale, Mich., Feb. 26, 1882.

*The numbers beginning paragraphs refer to questions in a circular on page 63.

REPLY FROM E. S. SNOW, M. D., OF DEARBORN, MICH.

1.* Yes; in both number and character.
2. Premature development; weakness and exhaustion of brain and nervous system.
3. Girls.
4, 5. Yes.
6. No.
7. Yes.
8. No.
9. Generally good.
10. I think so.
11. Yes.
12. Not decidedly so.
13. No.
14. Yes. Respectfully,
E. S. SNOW, M. D.
Dearborn, Feb. 23, 1882.

REPLY FROM FOSTER PRATT, M. D., OF KALAMAZOO, MICH.

1.* Any graded system must make too much labor for some and too little for others.
2. Too many to enumerate.
3. Physically to girls.
4, 5. Yes.
6. No; scholarship and conduct alone should be the tests.
7. Yes, in some.
8. No.
9. Generally good.
10, 11. Yes.
12. No.
13. No, I think not; i. e., not for children.
14. No "study" of it by pupils, but more attention to "practice" by teachers and trustees.
Respectfully,
FOSTER PRATT.
Kalamazoo, Mich.

REPLY FROM HUGH MC COLL, M. D., OF LAPEER, MICH.

1.* Too much in number to be useful.
2. Superficial knowledge and injured health.
3. To girls about puberty.
4. Of quite serious illness in weak girls who were ambitious.
5. I think not.
6. Necessary absence should not, except so far as the standard of perfection in studies has not been attained.
7. Yes.
8. No. During seven years of teaching I have a record of 300 pupils, and the plodder always succeeded.
9. Usually good.
10. It would be difficult.
11. To those taxing the memory.
12. No; the poorest judges possible. They neither know how to teach properly, nor how much one of medium ability can acquire.
13. I think not as a rule.
14. Most assuredly; but first we must teach the teachers.
Respectfully,
Lapeer, Mich. H. MCCOLL.

REPLY FROM S. DUBOIS, M. D., OF UNADILLA, MICH.

1.* Yes; young children are crowded into "University arithmetic," the tendency of which is to ruin the brain power entirely.
3. Probably not much difference.
4. I have not personally, but have been informed of such.
5. Yes.
6. No. The tendency of this is to force attendance when illness is approaching, or is already established.
7. The tendency is to exhaustion of both.
8. This depends on the amount of exertion they may be required to make for a livelihood; if much, then No.
9. Good at first.
10, 11. Yes.
12. They are not. They are too much inclined to judge by their own standard of capacity.
13. No. I would favor two; in winter from 10 to 1 and from 2 to 4; in summer as usual.
14. Not for young children, but for advanced pupils. Respectfully,
S. DUBOIS, M. D.
Unadilla, Feb. 22, 1882.

REPLY FROM H. F. EWERS, M. D., OF UNION CITY, MICH.

1.* Not in ours here.
2. None.
5. No.
6. None here.
7. Yes, in some cases.
8. No.
9. No cases here.
10, 11, 12. Yes.
13. No.
14. Most assuredly.
Respectfully,
Union City, Mich., H. F. EWERS, M. D.

From their replies the following statements are selected:—

Dr. A. F. Whelan of Hillsdale says:—The subject of hygiene is of the greatest importance and requires most thorough investigation.

Dr. W. B. Smith of Ann Arbor thinks work too great, and has knowledge of cases of illness. Does not like the five hours session, but the teachers and scholars in high school seem to like it.

Prof. G. E. Frothingham of Ann Arbor says:—Bright and ambitious scholars are allowed to take too many studies, and according to my observation are often overworked. Specialists or experts are unmindful of the difficulties that the students meet, and are too exacting and impose too much work on the students. The study of physiology and hygiene by all means the most important studies, and the most neglected.

Dr. Wm. Parmenter of Vermontville would have taught in addition to physiology and hygiene "the effects of alcoholic beverages upon the human system."

The next paper was by Prof. W. S. Perry, Superintendent of the Ann Arbor schools, and is as follows:

THE HYGIENE OF STUDY.

BY PROF. W. S. PERRY, SUPERINTENDENT ANN ARBOR SCHOOLS.

The world has been taught that brain work is antagonistic to bodily vigor. Indeed this conclusion is fairly inferable from Herbert Spencer's discussion of over-education. In some less informed quarters our schools are looked upon as little better than organized machines for slaughtering children and youth.

The press especially fosters the idea. Slashing editorials under such captions as "Cruelty to school children," perhaps clinched with an itemized account of the daily work of a pupil in this or that grade, are greedily devoured by the masses. It would almost seem as if some of these pretentious literati had taken for literal fact and attempted to imitate Kingsley's description of these over-brain-worked children in his fairy tale, "The Water Babies." He says they were pretty children once, but they were kept working, working, working, learning week-day lessons all the week-days, and Sunday lessons all the Sundays, and weekly examinations every week, and monthly examinations every month, and yearly examinations every year, until their brains grew big, and their bodies grew small, and they were all changed into turnips, with little but water inside, and when the Examiner of all examiners came striding among the poor turnips, binding heavy burdens and grievous to be borne, and laying them on little children's shoulders like the Pharisees of old, but not touching them with one of their fingers, these poor turnips, in their haste and fright, crammed themselves so fast to be ready for the examiner that they burst and popped all around by dozens, till the place sounded like Aldershott on a field day.

The public school is the scapegoat of modern society—yea, more, the R. G. Whites, the Montgomeries, and their echoes have found that not only the Tweeds, the Guiteaus, the rascalities of society and the corruptions of the civil service, but also the hunchbacks, the insane, the blind, the flat-breasted, the short graves in the cemetery, are in large numbers, nearly or remotely, the outcomes of the methods of instruction in the public schools.

Now there may be an occasional case of over-mental application in the schools, but the existence of the evil must not be assumed upon too slender premises.

It may aid us to a better understanding of the subject to consider the organization of the public school, or more particularly the graded school. It is assumed when a child enters the first grade of the school that his reasoning faculties are still dormant, that his imagination and conscience are but incipient buds, that his conceptive faculties, his memory, his powers of association

and classification are in abeyance, and that he has little or no power of attention. It is the business of the school primarily to develop all these powers and faculties, secondarily to furnish the mind thus nurtured with appropriate knowledge. The course of study and program of work are based upon these assumptions or principles.

The subjects of the child's attention, while not numerous at first, are frequently changed, the exercises varying from 10 to 15 minutes in length. As far as possible the work is objective, appealing to the eye and employing the hand. Reading, spelling, counting with objects, arranging card letters, making lines, letters, and pictures with pencil, listening to stories, with perhaps some kindergarten employments interspersed, make up the child's daily history.

From term to term, and from year to year, the number of exercises per day is diminished, and the time of each lengthened, the conceptive faculties are appealed to, the observing faculties are exercised, the memory is more and more taxed, but up to the middle of the third year, or perhaps the fourth, no book is put into his hands except a reader. During the fourth year some of the easiest analyses of numerical operations will be attempted, leading to the logic of arithmetic, but nothing severe in this department is expected before the seventh year. During these later years of the grammar school course, the seventh and eighth of school life, the number of subjects per day is considerably lessened—more prolonged attention upon each subject is expected, and some independent logical analysis is attempted. The elementary botany, the course in geography and history, require some power and facility in classification and generalization.

Notwithstanding the disciplinary purpose of the course of study, nothing is admitted to it below the high school, *i. e.*, the first eight years, that is not especially practical, or in other words, that would not be of especial value to the pupil were he never to enter the high school.

In the high school the regular number of recitations per day is three, of nearly an hour in length. The principal object here is the higher and severer discipline of all the mental faculties. And yet here the course is carefully graded, the first year being relatively simple and scarcely removed from the methods of the grammar school, while in the senior year there will be found some of the more abstruse reasonings in mathematics, languages, and the sciences.

There are places in these twelve years of school-life that, from the nature of the text-books used, are a little too easy or too difficult—but as a whole it is as regular an ascent, as careful an adaptation of mental work to the growing capacities of child and youth, as close study and much experience of the best minds in the educational field can devise. And yet so learned and sensible a periodical as the Scientific American gives utterance to the following estimate of the schools: "Taking the schools as they run, good, bad, and indifferent together, it is speaking within bounds to say that two-thirds of the work done in them might be wiped out and abolished to the benefit of the children. They might then learn in a reasonable way some things worth their while to know, in the learning of which in a proper way they would be educated and not stultified as they all are under the more or less mitigated fashion now prevalent."

Such statements are frequently a combination of peevishness, stupidity, and recklessness, and they only serve to show how ridiculous a useful and efficient

member of society can become when he assumes the monitorial role in spheres beyond his education and experience.

Suppose we apply the doctrine of the Scientific American to some other interests of society, as the mechanic arts. Many of us could affirm with quite as much reason as justified the utterance of the aforesaid journal, "Taking the mechanics as they run, good, bad, and indifferent, it is within bounds to say that two-thirds of their shops ought to be abolished and the proprietors hung."

There are always more or less pupils, bright and ambitious, who are completing the twelve years' work in eleven or ten years, or who take extra work in the high school, while there are always others who from dullness of intellect or feebleness of body, or the limitations of poverty, are unable to keep up with their classes. Complaints of overwork are to be expected from these classes, but it is rarely the case that a pupil of good health, in regular attendance, fails to progress regularly over the course, or seriously feels the burden of his work.

The pupils in the schools are generally robust and healthy. There is an occasional invalid and an occasional death among them, but these are not the fruit of over-education. They are the fruit of feeble inherited constitutions, improper diet, improper clothing, irregular rest, broken sleep, the exactions of fashion and society, etc., etc.,—things that do not come within the purview and responsibility of the school.

Even if it be granted that an undue proportion of our pupils are breaking down in health at school, it does not follow that the cause will be found in their school labors. There is no more mischievous style of reasoning in vogue than that which connects by cause and effect facts which stand in juxtaposition. The barometer falls and it rains, therefore the barometer causes the rain. Society is full of fallacies arising from such methods of reasoning.

A pupil shows signs of failing health; the physician must know something of his patient's history. The most immediate and obtrusive fact is that the patient has been in school six hours a day, and the judgment instantly fastens upon that as the probable cause,—at any rate it is comforting to have a cause. The most striking feature of the school is the lessons, and therefore they are most likely to be charged with the ill-health that is found in the schools. "The teachers are working the children to death."

Now instead of advising a cessation of brain work, it would often be more wholesome to recommend better protection of the feet, less society and the street, more sleep and more judicious physical exercise, more fresh air in the sleeping room and less sour bread.

Says J. G. Fitch in his admirable lectures on teaching: "For one authentic case of permanent injury of health of a school boy or girl, from too much mental exercise, there are twenty examples of scholars who suffer from idleness or inaction." Prest. Bascom says: "Society is more to be dreaded than education."

When we consider the strain of society to which girls are often subjected, the early age at which they enter society and attempt to respond to its demands, often unduly stimulating the emotions and draining the physical energies,—so different from the sensible ways of their grandmothers; and when we consider that to these drafts upon the vitality of the system, the work of a full course of study in school, and not infrequently a course in music besides are added, is it any wonder that over-driven nature sometimes succumbs? Sometimes, however, the schools instead of aggravating these dangers of the

young, serve as an antidote to the poisonous stimulus of too much society. The fact is that cerebration, brain-work, is one of the most healthful of all human experiences. Unless there was a mistake in the creation of man, we might expect this from the very existence and connection of brain and thought, for they imply work, tasks, excitements, and occasionally extraordinary efforts. Indeed, hard study is one of the best of tonics. Upon this point Combe speaks as follows: "The brain is the fountain of nervous energy to the whole body, and many individuals are habitual invalids without actually laboring under any ordinary recognized disease, solely from defective or irregular exercise of the nervous system. But when the brain and nervous system are duly and agreeably stimulated, a benign and vivifying nervous influence pervades the whole frame and all the functions of the body are performed with increased pleasure and vigor." The large flow of blood to the brain does not, as some would have us believe, by so much drain the rest of the body of strength and vigor, but as the wielding of the sledge by the smith, so the handling of heavy and difficult ideas by the brain sends vitality and health coursing through all the parts of the body. We all know what vigorous brains, sound judgment, and good common sense are grown upon our farms and in our workshops without the advantages of the schools. So we may see manly forms and vigorous constitutions produced under the constant action of the brain; witness the sturdy, muscular forms of our statesmen and professional men everywhere. The fact is, nature is not at war with herself. Even the utmost exclusive use of one organ has its compensations and extends its beneficent effects to all the organs, to such an extent as to reduce the evil to a minimum. It is pretty generally conceded that the brain is an integral part of the body, and I suppose it a doctrine equally susceptible of proof that all mental work is brain work. The body is almost as much a unit as the mind. The hand cannot say to the brain, "I have no need of thee," nor the brain to the hand, "I have no need of thee," but whether hand or brain suffer, the other suffers with it, or if either rejoices, so does the other.

Herbert Spencer says: "The extra quantity of blood supplied to the brain, in any effort beyond normal activity, is blood that would else have been circulating through the limbs and viscera, and the amount of growth or repair for which that blood would have supplied materials is lost." A similar assumption seems to underlie much of the criticism of the present day against hard study. "Whatever the brain does, it does at the expense of the body" seems to be the doctrine. Now this implies that the brain is not a part of the body, or else, supposing it to be a part of the body, it implies that the exercise of one part of the body, especially beyond a "normal activity," subtracts from the growth and repair of all the rest of the body. Such a doctrine in force in our schools would soon give us a generation of flabby brains. and put us on the swift road to an effete civilization.

Now I take it that the highest work of the highest civilization is the building of efficient brains. Some of the laws of this production are patent to all. While physical employments, the demands of business, and the financial enterprises of the day are large contributors to this object, the duty is mainly laid upon the schools to lay the proper foundation for the grand superstructure. The mind grows by being trained to steady processes, by being tasked and stimulated.

There is an opinion abroad that education ought to be made easy, free from strains and struggles, that our children ought to be carried over the course of

study on flowery beds of ease, and when the turnips begin to sing "I can't get my lesson, the examiner is coming," there is some cruelty in the management of the schools. The simple answer to this is that the criticism is a mistake of ignorance. Strong brains do not grow like oaks in the forest, nor do they flash forth like meteors in the sky; they are rather forces forged in the heat of intense mental effort and study. Genuine, successful study is toil, it is rapt attention for definite results, it is agony of soul issuing in victory. And this is the very brain exercise which we claim is conducive to health.

In some cases the charge against the unhygienic conditions of school instruction lies mainly against the strain of examinations. Now nature seems to expect that we keep a reserve of energy for special occasions. Such emergencies are frequent incidents of every successful life in after years, and it is well that our youth be trained to them in school. Why should it be safe for boys to venture the strain of a ball-match or boat-race, and unsafe to risk the strain of a school examination? Moreover we often forget the recuperative powers of the young,—how quickly nature restores the normal balance of the system after severe exertion.

Again it is sometimes charged that our pupils study too many hours per day. In the Ann Arbor High School pupils are required to recite 15 or 16 lessons per week. The average time for preparing these lessons is estimated at 2 hours each, making 48 hours of study per week, or 8 hours per day for 6 days. This does not seem to me excessive. If thought to be so either in itself or as compared with the habits of some professional and literary brain-workers, it must be considered that (1) a pupil's work is not ordinarily worrying,—he has no responsibilities beyond his personal interests and ambition to weigh upon him. As a matter of fact the most of the worrying is done by the better scholars, in their ambition to excel. (2) A relatively small proportion of the pupil's work is of the logical or analytical kind that severely taxes the brain,—it is largely memorizing. (3) The pupil's work is greatly varied by the nature of his studies. From geometry to Greek or history is like changing a weight from one hand to the other. This is very different from the work of producing a Paradise Lost, or of managing a difficult case in court. (4) The youthful mind is very elastic, and soon recovers from the repression of any great or prolonged intellectual effort.

I do not believe that any less time than here indicated would be conducive to the health of our pupils. Ignorance or misguided ambition sometimes places an invalid, who ought not to be subjected to any nervous strain whatever, upon the examination bench, but the schools must not bear the blame of it.

It makes for the correctness of my position, that the faculties and forces of mind developed by continued, hard study, are conducive to health and longevity. Close mental application is a nourisher of hopefulness, ambition, elasticity of spirit, which are better promoters of good health than all the medicines in the dispensary.

Again, hard brain-work engenders a strong will, and an iron will is the companion of great physical endurance. A powerful will rises superior to vexations, obstacles, and enemies, that crush feebler spirits. Its possessor often continues to live and thrive simply because he will not yield. The brain-worker, moreover, lives in a calmer atmosphere, orders life's burdens and experiences more wisely; he takes broader views of life and so escapes much of the worry and carking care that drive so many into premature graves.

There is one seeming exception to the doctrine herein defended, *viz.*: that which concerns the use of the eyes. It must be conceded that myopia prevails extensively in the schools, but whether from study *per se*, or imperfect light may not be affirmed. Extended examination seems to have proved that a large percentage of pupils are afflicted with near-sight, and that the percentage increases with the stage of advancement in study and length of school-life. Admitting this, it is quite probable that a considerable portion of the weak and diseased eyes of school-children are fairly referable to bodily ailments, late hours, dissipation of one sort and another, poor food, etc., having no connection with school duties.

Is there any evidence in the schools that hard study is not conducive to health? I think not. The pupils of our high schools are apparently as vigorous as any set of boys and girls in the community. If brain-work is the enemy of rosy cheeks and vigorous steps, we should expect to find especial evidence of it among the girls who are pursuing coördinate courses with young men in the University. But the evidence is all against such a theory. The young women show no signs of physical faltering, nor of mental faltering. President Angell says they persist in being vigorous, cheerful, and successful in spite of predictions of their failure.

How is it at Vassar? From a paper by Prof. Orton in 1874, we may conclude that there is no college in the country where there is more physical elasticity or more solid mental toil. "The world may be challenged," says Miss Dall, "to produce in any one neighborhood four hundred young women of so great physical promise. The reason is obvious; their habits of all kinds are regular and conformatory to the laws of health, and they enjoy the daily stimulus of energetic brain-work." Although the students at Vassar, as Prof. Orton says, work like heroes and are nervously anxious for approval, statistics show that there is less absence from school duties on account of ailments than at Amherst, and all comparisons with colleges for men as to health and steadiness of application are altogether favorable to Vassar. We conclude that study under right conditions and methods is a great promoter of health.

Has our modern civilization, especially our western civilization, with all its heat, its maddening race for wealth, its struggle for distinction, its intense social life, and its ceaseless mental toil, any lessons for us in considering this question? Is the race degenerating as civilization advances? Is our admitted nervousness favorable or unfavorable to effectiveness and length of life? Statistics collected by Dr. George M. Beard, covering a period of twenty years, seem fairly to establish the following facts:—

1st. The brain-working classes live much longer than the muscle-working classes.

2d. Brain and muscle working classes live longer than exclusively manual labor classes.

3d. The greatest and hardest brain-workers live longer on the average than brain-workers of ordinary ability and industry.

4th. Longevity increases very greatly with the advance of civilization; the increase is too marked to be explained by improved sanitary knowledge.

Dr. Beard ascertained the longevity of 500 of the greatest men and women in history, including all the precocious and short-lived men like Byron, Keats, and Mozart, and he found that their average longevity exceeded the average longevity of all classes at the present day that live above twenty years, by fourteen years.

These statistics have been confirmed by scientific observations in Germany and in England. I think we should expect that clergymen, from their unremitting sedentary habits, their close mental application and constant toil, would be found among the shortest-lived of the professional brain-workers. As a matter of fact they stand the highest of all classes in the scale of longevity.

Respecting all this statistical evidence it may be said that improved sanitary knowledge will account for some of it; that while hard brain-work may be good for old heads, it is death to young ones; or that the long-lived are only examples of the survival of the fittest; or there may be other attempts to explain away its force, but I believe that after all fair deductions have been made, it will stand substantially unaffected as proof of a very important law of human progress; that the intense mental activity so interblended with a high and growing condition of civilization as to be both cause and result, is not undermining the vigor of the race, but on the contrary is gradually increasing its efficiency and longevity.

In the use of such expressions as hard study, intense brain-activity, etc., I would not be misunderstood. The terms are relative, and must be interpreted with reference to the nature of the course of study as outlined in the early part of this paper.

If the intense intellectual activity of the time, or if the school systems as now in force and administered, were tending to reduce the vigor and longevity of the race, the outlook would indeed be dark, and the heavens would be brass over our heads. But it is far otherwise. The schools are the conservators of the physical, as they are of the mental, well-being of society.

Perhaps I cannot better close this paper than by quoting from one of the ablest, most dispassionate and practical teachers in this state,* as expressing my own firm conviction: "It is my belief, confirmed by experience, and careful observation, that school-life, as now conducted, really tends to health and longevity of pupils, and moreover subserves the public health."

W. S. Perry.

Both of these papers were discussed at some length by Judge Cheever, Rev. D. C. Jacokes, and others.

Judge Noah W. Cheever spoke on the subject; his remarks were substantially as follows:—

When we violate the laws of political economy, we violate the laws of health. We bury night-soil in privy-vaults, lose a most valuable fertilizer, and create a source of poison that drains into our wells and cisterns, fills the air with noxious odors, causing typhoid fevers and other kindred diseases. What is it that we smell on our streets, particularly on a damp evening? It is particles of decayed matter from the privy-vaults floating in the air. With every breath we draw these particles into our lungs, the blood becomes poisoned, and we die of typhoid fever, because we will not heed the teachings of science. How shall we avoid this? Fill up the privy-vaults and use the dry-earth system. Prof. A. B. Palmer has worked hard for years to get our people to adopt this system, and a very few have wisely followed his advice. My brother, Prof. B. W. Cheever, has used it with perfect success and satisfaction for several years; and I have used it for over two years, and shall never allow another privy-vault on my premises. The construction of privies for this purpose is very simple. For a privy apart from the house, dig no vault, but build the usual brick wall about two feet above the ground on the front and ends, leaving the rear open, and a cross-wall about eighteen or twenty inches from the rear, or directly under the front part of the privy seat. Plaster this rear space under the privy seat with water lime same as for a cistern on the sides and bottom. Hang a door over this open space so that it may be raised up to clean the vault. If the privy is connected with or opens into the house, then the vault should be lined with galvanized iron made water-tight, and a four-inch pipe should connect the vault with the kitchen chimney, so that all possible odor will be carried off. Dry earth or wood or coal ashes, with a

* Prof. E. A. Strong, A. M., of Grand Rapids, Mich., in a paper on "Health of the Young as affected by the School and School-Architecture," on pages 166–176 of the Report of the Mich. State Board of Health for 1880.

little common lime mixed, should be placed in a box or old pail in the privy, and about a pint of this should be thrown into the vault when used. Three barrels of dry earth scraped up from the road (clay soil is best) will last through the winter for an ordinary family. The vault can be cleaned with an ordinary shovel and wheelbarrow, and the contents may be thrown on a garden near the house. In the summer it is best to cover with a little dry earth, and no offensive or poisonous odors will be produced. If we continue to bury our manures in the earth, or wash them into the rivers, lakes, and oceans, we will in time make a desert of our country, now the most fertile in the world, and millions of valuable lives will be destroyed by fevers and pestilence that medical science will be powerless to stay.

Changing rather abruptly to the other subject, we will now briefly touch upon the question of physical and moral training in our schools and University. I shall not criticise the character or conduct of the teachers in our schools or the professors in our University. In the main they are as noble and faithful a class of men and women as can be found. I believe also that our schools and University are very closely adapted to the wants of our State and the Northwest. Still I think that physical and moral training are much neglected in our schools and University. I am aware that many of our professors contend that student and professional life does not tend to injure men physically. They admit that want of fresh air and sunshine are injurious, that sedentary habits without much physical exercise tend to weaken physical powers; but we do not, and in a great measure cannot, be students without suffering these deprivations. In addition to these, our honest students and scholars are required to study too many hours. Most honest students with three studies are required to spend from twelve to fourteen hours in study and recitations. Many study till twelve o'clock at night, or later. These are boys and girls who are growing. No one would think for a moment of working young and growing animals in this manner; and if he did he would be stopped by the due execution of the very wise laws upon that subject.

No young man or woman under twenty-one years of age should study after nine o'clock at night. They should also in some manner be required or induced to take exercise in the open air at least for one hour each day. Men are fast learning that the discipline obtained from books is not the only or most valuable discipline to fit men for their life work. Most prize students, and men noted for their ability to master books, are failures in practical life. Good health, good character, a practical knowledge of affairs and of men, is more important than the discipline obtained from the study of books. In addition to this all our scholars and students should be taught in the schools and University, the evils of intemperance and all forms of vice. This is done with good results in the medical department of our University. This is important because education makes the vicious man a more powerful engine of destruction than he would have been if left in ignorance.

Education may thus become a curse instead of a blessing. Temperance and morality are the foundation of all valuable mental training. Our schools and University should first use all means to establish and maintain good health, purity of character, and then build a broad and substantial culture upon this. I do not mean to intimate that the students in our University are more intemperate and immoral than the students in other colleges. On the contrary I believe they are, as they ought to be, better in this regard than any equal number of young men and women in any city or college in this country. All will, however, concede that there is much room for improvement. But you may say that this work ought to be done by the churches and parents. I concede that it would be better if it would or could be; but the churches cannot reach as many as the schools and colleges, and many parents are ignorant or indifferent, and some absolutely vicious. Then too, the average American parent holds his children at arm's length, and never becomes their companion and guide. Animals may be safely left to themselves; but young humanity must be protected and guided to get safely established. The human mind and conscience left to themselves will never prove a safe and sufficient guide. They must be trained and developed, and armed with the experience of good and mature minds and hearts. But you say that a knowledge of evil may lead to evil. I admit that knowledge is only one of the safeguards, and is not always effective.

We find that physicians become drunkards, opium-eaters, and grossly immoral; but this is the exception, not the rule. Some children will put their hands into the fire after being told that it will burn, but most children will not, and no mother ever dreams of taking these exceptions for a guide. As a rule, if you show the young the pitfalls in their way they will shun them. Show them the evils of intemperance, vice, and crime, and they will avoid them.

The question after all resolves itself practically into this: whether the young shall learn of all manner of evil from parents and teachers, or from the vile and vicious. It would seem to be in accordance with the plainest dictates of common sense that they should obtain this knowledge from those who would so impart it as to lead them to shun evil. All educated men and women should use all the means and opportunities within their reach to place around the young all the inducements possible to lead them to purity of life and character. These were substantially the views of the late Dr. Henry P. Tappan, first president of our University, and were carried out by him in his lectures to the senior classes. It would seem to be wiser to give this instruction and training to freshmen rather than to senior classes, and better still to have the work begin in the

preparatory schools. I have not made these remarks because I thought we were getting worse than our ancestors. On the contrary we have made wonderful progress in temperance and morals in the past thirty years; but there is still much to do to elevate humanity to the high plane of the Creator's design.

The papers on the program by Hon. Azel Ames, Jr., M. D., of Boston, Mass., and by R. Humphrey Stevens, M. D., of Grand Rapids, Mich., were not read, owing to the failure of the authors to be present.

Prof. A. B. Prescott gave an interesting address on the subject of water-supply, and he was followed by S. P. Duffield, M. D., of Dearborn, Mich., who spoke of the river Rouge.

The convention then adjourned until the evening session.

FIFTH SESSION, WEDNESDAY EVENING, MARCH 1, AT 7:30.

The first paper on the program was a very practical one on the subject of "Utilizing the Press for Sanitary Objects," by W. L. Eaton, editor of the Kalamazoo Daily Telegraph, of Kalamazoo, Mich. The Secretary regrets that he was unable to secure a copy of this paper.

The next paper was on "Ventilation," by Prof. J. W. Langley, of Ann Arbor. It is as follows:

VENTILATION.

BY PROF. JOHN W. LANGLEY, S. B., M. D., OF ANN ARBOR, MICHIGAN.

The subject of ventilation may be considered in several ways: 1st, from the standpoint of the physician, who is anxious to impress upon the public the great danger to life and health which arises from the neglect of sanitary laws; 2d, from that of the sanitary engineer, who brings his knowledge and skill to the mechanical questions involved in the problem of the removal of foul or tainted air from our homes and supplying its place with that which is pure and health-giving; 3d, from that of the physicist and chemist whose researches have furnished tests and appliances by which the degree of impurity and the departure of the air from a given standard of excellence can be accurately gauged, and by which the somewhat vague evidence of our senses can be supplemented by statements which are removed above the region of controversy.

In the above division of the subject, the great importance of the second head, the division handed over to the sanitary engineer, is apparent. Here we find the practical working of applied science; here we look for action in place of theories, deeds in place of words, and execution in place of propositions. Efficient ventilation which shall be nearly self-operative, ready to work at all times and not liable to get out of order is essentially a matter of architecture, an end to be labored for by architect and engineer together. But while something has been done in this direction, how little it is in the aggregate. How few buildings do we see where any effort has been made to produce a systematic current of pure air, or to provide for the removal of that which is bad by any better means than the hap-hazard opening of doors and windows, or through the fortunate imperfections of carpentry which leave crevices at lintel and threshold where a little attenuated stream of health may force itself in.

Architects and engineers stand ready to build anything their patrons may desire, and if proper ventilating appliances are not common the fault lies much more with the owner of the house than with the professional experts who have built them. We do not find highways built much in advance of the population who intend to use them. Steamships do not go to ports where

there is neither freight nor passengers, and improved ventilating-architecture does not precede the demands of the public. If by any means the various sources of impaired health could become visible, if the breath from our lungs would only show itself as a cloud of soot like that from a smoky lamp, the public would instantly awaken to the fact that in this matter of ventilation our civilization is comparable to those nations who know no better way to warm themselves than to build a fire in the middle of their huts and let the smoke find its way out of window or door as best it may. Towards the art of ventilation the public is nearly as indifferent as our ancestors were to their smoky fires before men had yet learned the simple fact that smoke would go out of a chimney if one were only built for it to first go into.

All persons interested in sanitary science clearly recognize that it is their duty to become preachers of the necessity for, and methods of, ventilation. I shall therefore make no further apology for planting myself on the platform of the chemist, and collecting some data from the authorities who have written upon the subject of air and its impurities. These facts are familiar enough to the medical profession. I do not propose to add anything new to them here, but I will hope that they may call the attention of some not of our profession to the importance of this subject.

We may define the purpose of ventilation to be this, to supply our dwellings with air having as nearly as possible its maximum purity, and at the same time to remove all noxious materials which the processes of life engender and throw into the atmosphere.

Naturally here we are asked this question: Is there a standard of pure air, and is there any assurance that a standard true for one locality may be set up for other regions as well? To this we reply that the composition of the atmosphere appears to be wonderfully uniform and that in the researches of a well known chemist, R. Angus Smith, as published in his work "Air and Rain," we have the best evidence of the fact. Quoting then from Smith's book we find the following as the mean of many hundred analyses taken from many localities:—

Locality.	Oxygen, Volume, per Ct.
On the sea shore	20.999
Top of hills	20.98
In the country during rain	20.98

Or a mean for sea shore and open country of 20.984. For places where the air is presumably less pure we have the following:—[In November]

Locality.	Oxygen, Volume, per Ct.
London, N., N. E., N. W. side	20.857
London, S., S. W. side	20.883
London, E. and E. C.	20.86
London, W. and W. C.	20.925
London, Parks and open places	20.95
Mean of all	20.895

Analyses of the air of Manchester and other large cities, give similar results; so that we may consider that ordinarily good air has the following amount of oxygen by volume:—

Locality.	Oxygen, Volume, per Ct.
Country and sea shore	20.984
Cities	20.895
Or for the mean of both, nearly	20.94

The carbon dioxide, or to call it by its incorrect but more familiar name of carbonic acid in the air, is a very important ingredient. Since this substance is constantly produced by the processes of combustion and by the respiration of animals, and poured into the air in quantities which are enormous in the aggregate, we always expect to find it and do indeed detect it in notable amounts. When present beyond a certain normal quantity it acts upon all warm-blooded animals which are compelled to breathe it like a narcotic poison, gradually reducing the energy of vital action till it ceases altogether. Now when we consider that each adult produces each day about 3.66 lbs., or nearly 47 cubic feet of this gas, its rapid accumulation in badly ventilated places becomes inevitable. Smith reports a large number of analyses which may be summarized as follows, the quantity of carbonic acid, CO_2, being given in volumes per 10,000 of air:—

Locality.	Carbon Dioxide, Volume per 10,000 of air.
Suburbs of Manchester, mean	3.69
Streets of Manchester, mean	4.03
Thames river, mean	3.43
London parks, mean	3.01
London streets, mean	3.41
Munich, mean	5.00
Average of all	3.76

But as the amount of CO_2 in thoroughly ventilated houses is always higher than this, because of its rapid production by lamps and human beings, we may raise the above figures a little and consider that 4 parts of CO_2 to 10,000 of air represents a fair standard of purity in respect to carbonic acid.

Concerning vapor of water which is also always present, it is difficult to speak with precision. It varies so greatly in amount with the time of day, with the season and with the weather that nothing more than a general estimate can be given, but probably for our local climate here 40 parts of water to the 10,000 of air will not be very far from the truth. Thus the answer to our initial question is made by the chemist, on the authority of Dr. Smith, as follows:—

"The standard pure air contains—
Oxygen, 2,094 parts per 10,000 of air.
Carbonic acid, 4 parts per 10,000 of air.
Water vapor, 40 parts per 10,000 of air.

Having thus established a standard of purity, we may next enquire how far this standard is lowered by the circumstances of our daily lives, how far certain given conditions constantly realized in this city of Ann Arbor, and in every town in the United States, contaminate and degrade the pure air coming to us from the forest and the plain.

Again quoting from Smith:—

	Oxygen, Volume, per Ct.
Air from a back yard	20.70
London air, metropolitan railway	20.70
Air from stables	20.74
Average	20.71

For the carbonic acid we find the following:—

	Per 10,000.
In stables	8.33
In cellar of laboratory	5.72
In study of house	11.77
In schoolroom	9.7
In theatre pit	27.34
In theatre gallery	13.58
In certain mills	28.6
In work-house, av. day	5.6
In work-house, night	7.77
Average of all	13.15

It is seen from the above figures how clearly analysis points out the degree of impairment which the air has suffered. In oxygen it is the difference between 2,094 and 2,070. So that the average for back yards, stables, etc., is a loss of oxygen of 24 parts per ten thousand of air. In the above table we notice some striking facts. The normal amount of CO_2 in pure air being 4 parts, we find that in stables the quantity of this injurious agent has doubled. In the schoolroom it has more than doubled. In the work-house chambers at night it has nearly doubled, and in a gentleman's private study it had become nearly three times the normal quantity, while in the pit of the theatre and in large mills it had risen to the alarming proportion of seven times the quantity found in pure standard air. Is it any wonder that the unfortunate occupants of these places should find the air "close" and even deadly.

It has long been known that a lighted candle lowered into wells and cisterns was a very good rough test of the condition of the air. If the candle continues to burn, a man can descend and remain there, for a short time at least, with impunity.

During Smith's study of the ventilation of mines he found many cases where the workmen would be compelled to cease work because their candles would burn so dimly they could not see to handle their shovels and picks. In these places the lights could be temporarily improved by inclining the candle so as to melt away the grease more rapidly and thus enlarge the surface of the wick. The miners in extreme cases could live even till this remedy failed and the candles were spontaneously extinguished.

The parallelism between the way in which candles and human beings are affected by deficient ventilation is much closer than anyone would at first thought believe; both are examples of processes of combustion, both generate heat, and the flame goes out, or our vital actions cease whenever the generation of heat from within does not equal the loss of heat from the outside.

By employing a close chamber lined with lead so that it was practically air-tight, and burning candles in it, it has been shown that the candle flame is extinguished whenever the free oxygen present is reduced to 1745 parts per 10,000 of air.

I desire here to introduce a somewhat lengthy quotation from Smith's work, because it is the first important record of the correspondence between our sensations and the corresponding conditions of bad air as shown by chemical analysis.

"Here I am describing feelings, and to some persons they may simply be fancies, but I shall describe them nevertheless, as I believe man has learned

nearly all he knows of ventilation by attention to these feelings, while chemical analysis is attempting to struggle after him, and is continually finding itself behind in the race. The feelings are uncertain, it is said. This is not quite correct; they are to us most certain, but they register so many phenomena at once that they become uncertain guides when one only is sought after. For example, we may imagine that they tell of increased carbonic acid, whereas they may simply be telling us of diminished digestion and vigor. As to personal qualifications for such experiments, I may merely say that I am not peculiarly sensitive to bad air; many of my friends are more so; but having my mind more directed to the subject I obtain a certain advantage. Perhaps my love of fresh air is beyond the average, as I have an actual pleasure in east wind. If these two conditions are contradictory, it certainly is not my fault; but they are not so; experiments in the lead chamber showed that even when nothing unpleasant was perceived, the pleasure of coming out to the air of the laboratory was like that which we have on the seashore or the mountains, so that the love of pure air is not in exact proportion to our incapacity to endure bad air. Again, I may say that all my fancies lead me to imagine I can bear anything that others can in the way of air, and although this may not be true, it entirely kept away all imaginings of evil during these experiments, and led me to points where actual and long-continued discomfort was the result. I think it important to mention this entire freedom from any illness or tendency to illness caused by the imagination.

"The first trial of the chamber was made by simply sitting down for an hour and forty minutes. This produced about one per cent of carbonic acid, [*i. e.*, 100 in 10,000, or 25 times normal]. The day was clear and the air pleasant; the temperature 45°F. No difference was, to a certainty, perceptible for twenty-five minutes. Then when the air was drawn from the top by means of an umbrella, it seemed like a soft wind, and had to some extent a pleasant feeling, but was entirely devoid of a faculty of cheering. A dull, cheerless air is well known. Here we had it produced at once. The air was very moist, and deposited water when drawn out through a tube on taking a specimen.

"After an hour the unpleasant smell of organic matter, such as is so well known in a crowded school, was perceptible on stepping rapidly from one end to the other, or on moving the air rapidly. Here we learn that when a current of air blows on us, the chemical actions accumulate, and although if continued for one instant only they may be imperceptible, if repeated for many they culminate in a sensation.

"A sensation, such as smell or taste, is evidently the result of chemical action. This may be infinitesimally small; in that case the mind does not take cognizance of it; but if many of these small actions occur, either all at once, or so rapidly one after another that they cannot be separated, the mind observes them, and a sensation is the result. How many atoms or molecules must be moved to cause a sensation it is not possible for us to tell, but we can very readily tell that for some persons one, two, or twenty times more must be moved than for others. These chemical actions are constantly going on in the body. They may take ten years to gather impetus to make their movements strong enough to produce sensations, and disease may be generated unknown to the individual, although it may kill him in the eleventh year. But if the chemical action began at the first so violently as to produce decided sensations, he might be able to avoid it at once before it produced any abiding impression. For this reason, a bad climate is more dangerous than the fumes of vitriol,

when we are at all able to move out of the way. Concerning the climate, we reason from very distant premises frequently, as no smell is perceived; but the vitriol explains its character at once, and tells its intentions.

"Exactly in the same category as the bad climate are all places in which the air is inferior, without containing any peculiarity which the senses can detect. Now although the mine air is all or nearly all such that the senses could perceive it at once, if we were introduced into it at once, we enter so gradually that we are scarcely conscious of the increasing deterioration. As it takes a long time to enter, and a long time to come out, we are incapable of comparing the air of mines by the use of our senses in the same way that we can compare the air of any place above ground, out of which we can come suddenly. This being the case, we are obliged to pay more attention to those phenomena that are only perceptible to the senses in their results after years, and also to chemical experiment, which two methods after all must turn out our most certain guides. It was very decidedly perceived, after remaining an hour, that the air was soft when made to move in this chamber. This arose from the moisture, and shows us at least that a soft air may be an impure one. Soft air, air with a good deal of vapor, is very soothing; it calms the mind and the body; and the burning of a candle or a fire.

"In this state it cannot be very cold, as the warmth is essential to the existence of the vapor. This air has a tendency to leave the skin and its action unchanged; it causes little evaporation, and perhaps an influence is due to this, that the amount of oxygen introduced into the lungs is diminished, whilst no injurious ingredient is added. I think I hear the question, Will not the air in the lungs decide for itself at once how much vapor there shall be, as there is such an abundant moist surface? The entrance to the lungs, that is, the nostrils and the mouth, feel the moisture with great clearness, and when the air is dry they are dried up. But the lungs seem to feel it also, and it seems a very common thing to know the difference in the respiration. Dry air stimulates the skin, because it removes moisture, and the skin must be set to work to renew it. Dry air, therefore, would in this respect be in its first action cheering, and in its last irritating. Moist air would from this point of view be calming in its action, and often at once calming to languor, probably preservative of the vital powers, which are not frittered away by constant irritations. I speak only as a chemist. After staying in the chamber for 100 minutes, the air had an unpleasant flavor or smell, and I came out; three persons entered at once, and pronounced it very bad; I entered after a minute and found it extremely bad. It seemed to me, however, that we are frequently exposed to air equally bad, although I have not found any in daily life so much deprived of its oxygen as this must have been, reduced, that is, to twenty per cent. I was extremely glad of the escape from this impure air; this gladness not arising from any previous discomfort. I was not uncomfortable. I chose that time of coming out, as it was the moment when the organic matter was most distinctly perceptible; still to perceive it when quiet required attention. The pleasure on coming out was one wholly unexpected, although I now recognize it as exactly that which one has when walking home on a fine evening after leaving a room which has been crowded; it was the reassertion of the rights of oxidation; the blood was evidently in active change, desirous to take up a position that was lost, else why was this feeling of unusual delight in the mere act of breathing, which feeling continued for four hours? Dinner seems to have first removed it. From the

long time required to bring the functions of breathing to their former state, we may of course argue that they had been much disturbed. If to this it is replied that after all it was merely the memory of the chamber still remaining it may be said that if the mind is fixed upon the subject, such a memory may exist, without, as far as we know, any equal corresponding prior affection of the body; but if the condition be unexpected and unthought of, the result seems to indicate chemical or physiological action. In about four hours the lungs recovered their tone. By the tone is meant their unconscious working. Food seemed to be more than usually required, and was followed with unusual rapidity by the feeling of refreshment. Now, as there was no unusual bodily exertion, the demand could not arise from an unusual wear of the system, and indeed the peculiar feeling was rather a need of support than actual hunger demanding food. We cannot suppose that much wear and tear was going on. We seem left to suppose only that decompositions which are needful to repair the body had not been made, although material was present, and that it took four hours and dinner to make up lost time. Although oxygen does not directly repair, it takes the initiative in any union of labor for the purpose. The second stay in the chamber, the day after the above, was continued for 160 minutes. At two hours and twenty minutes it was observed that very long inspirations became frequent and more agreeable than usual. The air about that time gave a very decided feeling of closeness. Standing on a chair, it was found less agreeable than below. The amount of oxygen was found to be 19.61, [*i. e.*, 133 in 10,000 less than normal]. Immediately on opening the door two or three persons entered and again perceived how uncomfortable it was.

"After the experiment on the combustion of candles, we entered with candles and a spirit lamp. The lights were soon extinguished and it was found impossible to rekindle them with matches. Wooden matches were used; they refused to ignite. Still we breathed without difficulty at first, but a gradual feeling of discomfort appeared of a kind which is not easily described; it was restlessness and anxiety without pain, whilst the breathing increased in rapidity.

"Afterwards gas was lighted and it burned with brilliancy. On entering after the gas had gone out candles were extinguished as rapidly and completely as if they had been thrust into water; nevertheless we still breathed, and although every one was anxious to go out, no very correct description of the feelings could be given. I stood on a chair, and then a feeling of incipient fainting began; but the senses were not annoyed by anything beyond a feeling of closeness, by no means so unpleasant as a school room or close end. This is a very important fact, as it points again to the organic matter, of which there was little here, and of which there is much in the school-room. The lungs seemed to refuse expansion, without the senses being able to indicate a reason. The actual amount of oxygen when the gas went out is not known, but a specimen taken from the room after the door had been opened long enough to allow three persons to enter, contained 17.45 per cent, [*i. e.*, 349 parts.]

"All these experiments tend to diminish our faith in the senses as guides under certain conditions. The senses are quite unable to measure degrees of closeness and raise as much alarm at a state which may be represented by 0.1 per cent of carbonic acid, as they sometimes do when there is nearly 4 per cent with a diminishing pulse and a quickening respiration, or incipient gasping for breath. After a while the air really becomes by no means propor-

tionately worse to the feelings, but the approach of fainting in the case mentioned showed that the lack of oxygen or presence of carbonic acid was telling on the moving vital act."

Ingredients other than gases are constantly met with in the air. By drawing large volumes of air over tubes moistened with glycerine the particles of the various floating solids are caught and may be examined. In such a deposit the microscope reveals an astonishing variety of objects, debris, and specimens from nearly everything on the face of the earth. Among inorganic material we find sharp, angular fragments of dust composed of quartz, dried clay, fragments of iron and other metallic oxides, traces of salt, sulphate of soda, and so on through a long list of materials. But the greatest variety and the most deleterious ingredients are found among organic bodies. We find shreds and fragments of the surrounding vegetation, sometimes oily and tarry globules, spores and seeds of fungi, and a host of microscopic living organisms, bacteria, vibrios, etc., and presumably we may infer also the presence of specific germs. Many of these forms of life live only by preying on the higher ones, and it is experimentally proved that so called spontaneous fermentation and putrefaction are often caused by the access of air containing these particles. It is customary to group all these except the first mentioned class under the name of organic matter. Unfortunately this organic matter cannot be accurately detected by analysis, but we know that much of it is constantly produced and discharged into the air by human beings. If then we consider that since CO_2 is also formed by the same agency, there will be a certain correspondence or ratio between CO_2 and organic matter depending on respiration, we may take the CO_2 which we can measure as a rough index of the quantity of the more deleterious organic matter which may be present.

Now the quantity of CO_2 formed by an adult is, as previously stated to be, about 47 cubic feet per day. It is shown by the analyses which have been quoted that in ordinarily well ventilated rooms the CO_2 will not rise above 6 parts per 10,000 if 4 parts are the normal quantity for pure air.

It is easy to calculate the volume of air necessary to dilute the CO_2 formed by each adult to the above limit of 6 parts. In this way we obtain some of the practical rules laid down by writers on ventilation. Thus General Morin makes the following statements:—

Quantities of air to be changed each hour for every adult person.

	Cubic Feet.
In cases of ordinary sickness	2,400
In surgical cases	3,500
In epidemics	3,700
In workshops	2,100 to 3,500
In lecture rooms	1,000
In theatres	2,100

These statements, although precise, will be better understood if we refer them to the sizes of rooms. An apartment 20 feet long by 15 wide and 12 high will contain 3,600 cubic feet. Now if we take 2,000 cubic feet per hour as the proper allowance of air for each individual, such a room as the above, if it contained four persons would require that all the air it contained should be wholly changed every 27 minutes. This is certainly much more ventilation than most rooms get under existing conditions of close stoves and tight windows.

The same authority speaks very highly of the open fire place. He says that

the open fire place, even without a fire in it, will convey in winter from 10,000 to 14,000 cubic feet per hour, and that with a fire it may carry off as much as 40,000. So that this well-known system of ventilation would seem to be quite adequate to its work during at least the cold months of the year.

In conclusion we may consider it as a fact proved by analyses and experience that we have a standard of pure air chemically determined. That the amount of deterioration of this air under certain conditions can also be found by analysis, and lastly that in rooms not provided with open fire places or ventilating flues, the presence of three or four persons with closed doors and windows, for an hour, will certainly bring this vital medium to a condition in which it may be called distinctly poisonous,—a slow poison it is true, but one whose insidious presence no one has a right to neglect.

The next paper was by Prof. M. W. Harrington, A. M., of Ann Arbor, on "Some Meteorological Aspects of Ventilation." It is as follows:

SOME METEOROLOGICAL ASPECTS OF VENTILATION.

BY PROF. M. W. HARRINGTON, A. M., OF ANN ARBOR.

There are a few points of common interest to the meteorologist and to the student of ventilation. Of these we may mention the method nature employs for the production of currents of air compared with those used by the architect, the dust of the atmosphere, and the means of eliminating it, the part this dust plays in explosions of mills and in coal-mines, and—closely connected with the last—the influence of the weather on explosions in mines.

1. As to the first, there is no doubt that where effective ventilation is to be carried on, a current of air must be set up. It will not do to trust to diffusion, as its action is too slow. The architect must make arrangements to make a river of fresh air pass through the building to be ventilated, percolating every part of it, as it passes. This stream will not pass through if left to itself; it must be driven through. While the necessary force may be applied by machinery, and the resulting current have any direction, it will usually be done by an ascending current of air passing through a heated flue. This is because this method is economical, and easily applied; and also because, as the air becomes rarer upwards, it offers little resistance to such a current. The production of such a current is an operation which nature frequently performs, and sometimes on a large scale. When, however, we come to compare her work with that of the practical ventilator, we find the latter seems to labor under a great disadvantage. The inquiry as to what the nature of this disadvantage is, and how it originates may therefore not be without interest.

The vertical currents play so important a part in modern meteorology that the circumstances under which they originate have of late years been frequently discussed. Of course air expands with an increase in temperature, and the warmer a certain volume of it is, the lighter it is. Computation shows* that when the decrease of heat from below upwards is about one degree Fahrenheit for each 50 feet, the air below is lighter than that above, and tends to rise. So rapid a change seldom occurs in nature. The decrease is generally only one degree for from 200 to 500 feet or more. With rare exceptions, it has been found, in balloon ascensions and the ascent of mountains, always to be more slow than one degree for 50 feet. Flammarion records an average, up to 12,500

*Reye, Wirbelsturme, 2d ed., p. 39 and Appendix.

ft., of 340 feet for a clear sky for each degree, and 350 feet for a cloudy one. In South America, Humboldt found it 344 feet for mountains, and 444 feet for table lands. In W. Siberia it is about 450 feet, in India 320–410 feet; on the slope of the Alps 300 feet. With us there is an average of about one degree for each 400 feet. In one of his ascents Glaisher found this gradient to be exactly one degree for the first 100 feet, but for the average of 1,000 feet it was only 182 feet. Barral and Bixio in an ascent in 1850 found the degree gradient only 44 feet.

After the motion is once set up, it may continue with a much smaller change of temperature—that is with a longer gradient. If after a mass of air has risen and has expanded to the density already existing at that elevation, it is still warmer than the surrounding air, it will continue to rise. This may occur, according to Reye, with a vertical gradient of 180 feet. Furthermore the vapor of water exists in the air though in very changeable proportions. It is lighter than dry air, and when the air is saturated with it it may make the air so light that the gradient will be that ordinarily observed in free nature, viz., 400 to 500 feet. Nature, then, can start an upward current of air when the gradient is 50 feet or longer, and can keep up this motion when it is once started if the gradient is 200, or even when everything is especially favorable, 500 feet. Now the difference in temperature between the inside and outside of the building is often more than one degree. Yet the architect must make an arrangement for a very much greater difference to make an efficient ventilation. This is not usually practicable. The air in the building cannot always be of higher, in summer it must be decidedly of lower temperature than the air outside. To heat up the whole mass of air is therefore impracticable; a substitute can be found in heating the air of a flue. This air will then rise and draw after it the air in the room to be ventilated. But to make this air rise the flue must be heated—not one degree nor two degrees—but, according to Morin,* from 36° to 45° higher than the air outside, and in some cases the temperature must be from 65° to 72° higher. The difference between the demands of nature for an ascending current and those of the sanitarian for a ventilating draft are very great; the one requires a difference of only one degree for each 50 feet, or even for each 500 feet; the other requires a difference of from 36° to 72° inside and outside his chimney. Let us examine for a moment to what this difference is due.

In the first place the motion in nature is free, while in ventilation it is confined to the area of the smallest section of the flue. It is the difference which would be found in emptying a millpond by suddenly removing the dam or by opening the mill-gate; in the first case the water goes off bodily and almost instantly; in the second the change in level of the millpond is very slow. If it were required to empty the pond by the latter as rapidly as by the former it could only be done by notably increasing the velocity of the current through the gates. In the same way, to rapidly empty a large reservoir of bad air through one or more small flues, a swift stream of out-pouring air must be set up and the great velocity can only be got by the expense of much energy.

Artificial ventilation has another disadvantage, as compared with nature, in that it cannot make the vapor of water play as efficient a part in the work as nature does. This vapor is lighter than air, and so decreases the weight of the air with which it is mixed. It thus has its effect in the formation of ascending currents; but this is not the only—indeed it is not the most efficient way

* Report of the Smithsonian Inst., 1873, p. 308.

in which it aids them. In the very operation of cooling and condensing it gives out its latent heat, thus rendering the air warmer. When water evaporates—that is, passes from the liquid to the gaseous condition—it takes up a notable quantity of heat which it utilizes in keeping up its gaseous molecular state. When the water again condenses, this heat is no longer employed and is returned to the air around, warming it. Thus we have one of those paradoxes which are so common in nature, viz.: damp air becomes warmer by chilling. As a mass of moist air rises it cools by expansion and by parting directly with its heat to its cooler surroundings; as it can hold less vapor when cool than when warm, it must sooner or later begin to lose the vapor by condensation; as the vapor condenses, the heat it has heretofore employed is liberated and raises the temperature of the air around; the air expands and rises again. This operation is continued until the amount of moisture condensed is not sufficient to disturb the equilibrium of the air. Thus moisture greatly promotes the rise of air by, as it were, adding fuel to the flame.

Another reason for the apparently extravagant energy which the practical ventilator must produce, as compared with nature, is, he must have a surplus sufficient to overcome any unforeseen weather obstacles. If the barometer falls the same volume of air-current is not so powerful for the removal of impurities. If the fall is an inch the efficiency of the current is only about 29-30ths, if an inch and a half only 19-20ths of what it was before its fall. The change is not great and would not be of much consequence in house and hospital ventilation; but in mines the case is different. It is claimed by some students of colliery explosions that the weakening of the efficiency of the current by the decreased density of the atmosphere indicated by the fall of the barometer, permits the dangerous accumulation of explosive gases, and may consequently account for the larger number of explosions at periods of low pressure. Other meterological obstacles to the formation of ascending currents of air exist and are illustrated in the direction taken by the column of smoke or steam rising from chimneys and volcanoes. Take a volcano sending out a continuous stream of smoke or steam; in calm weather the steam will sometimes rise in a great column to the height of several thousand feet, where it will be gradually dissipated by evaporation in the drier air around it. At other times it will send up a shorter column from the top of which the steam will spread out in all directions, like a great umbrella; again it will be the umbrella without the stem, and occasionally it will descend and hang on the sides of the volcanic cone or pour over the plains at its base. Similar phenomena are familiar in the smoke from our chimneys. In the most of the cases mentioned the phenomena are due to well-marked layers of air with different characters as to temperature, vapor-content, etc. The last case is an extreme one and worthy a moment's attention. In such a case the smoke of a town hangs immediately over it or descends on it covering it up like a pall. It may occur in two very different sets of weather-conditions. It may happen when the air is saturated with moisture. In this case the moisture loads the particles of smoke and other products of combustion and makes them heavier, thus producing a particularly disagreeable fog. This seems to be the explanation of the fogs of London, which are sometimes said to have the color and something of the consistency of pea-soup. The liquid and solid particles in the air will then render it like muddy water, more sluggish, and it will adapt itself less readily to the needs of ventilation. This settling of the smoke may also occur under a totally different set of conditions, viz.: when the air is dry, the sky

clear, and the barometer high. These are indications that that particular territory is occupied by an area of high pressure, and in such an area the current of air is descending. It does not reach the actual surface of the ground and so we do not feel it. It often deadens or is deflected at some little distance above the ground, and the smoke shows at what elevation this happens. A similar descending current is brought down by a heavy rainfall. The ascending current which the ventilator must set up must have velocity sufficient to carry on its work independently of any meteorological change which may tend to deaden it.

2. To pass to another and quite different topic we call attention to the fact that not all fresh air is suitable for introduction into our buildings. Leaving out of account here air which contains injurious amounts of deleterious gases derived from sewers and similar sources, we yet find that there are large numbers of minute bodies in the air, organic or inorganic, which it is desirable to eliminate before the air is admitted into our houses, hospitals, and schools. It is quite in the line of modern science to show that the minutest agencies are among the most universal and important, and we are just getting our eyes opened to the ubiquitousness and importance of that disagreeable factor of the atmosphere: dust. That it is an insidious but tireless enemy to contend with has been known ever since housekeeping became an art. It is to be fought with fire and water but not with the sword. Late investigations show that it is a geological agency which has buried cities, worn away rocks, and formed new strata. It is an esthetic agency, giving color to the sky, diffusing the light, toning down everywhere light and shade, giving to everything that mellowness and apparent age so dear to modern art. It is a meteorological factor of great importance, forming a nucleus on which the droplets of clouds condense to become later rain-drops and fall to the earth. Moreover it is a deadly enemy to the physician and surgeon, introducing into the labors of each a disturbing factor which often makes their efforts nugatory or worse. Still farther, it is an explosive agency capable of producing the most extraordinary displays of force, demolishing mills and sending instant death to every living thing throughout the wandering drifts of a coal mine. The dusts in the atmosphere are various as to source and characteristics. We may classify them as follows:

a. The results of attrition. They are comminuted particles of silica, clay, limestone, fragments of wood and other parts of plants, and broken fibers of wool, cotton, and linen. Under the microscope the fibers are the most striking and characteristic elements, their form easily betraying their character, and their coloring, red, blue, and others, indicating their artificial origin. They are found everywhere, but are, naturally, especially abundant in the vicinity of large cities. Some of the reported dust showers are due to these bodies. The microscopical examination of the dust which fell on the snow near Allegan in February, 1875,[3] convinced me that it was attrition-dust, though it is but fair to say that others after examination came to other conclusions.

b. The Products of Combustion. Such products as smoke and soot are familiar and have been long recognized as serious nuisances at such manufacturing places as Pittsburg and Cincinnati. We have recently been taught by Aitken[4] that there are other products of a dust-character which we had not

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[3] Proc. Ann Arbor Sci. Assoc., 1876, 31, 117.
[4] Nature, xxiii., 195.

known before or rather of which we had not suspected the importance. In making some experiments as to the formation of fogs, Aitken found that under conditions otherwise similar, moist air when cooled would or would not produce a fog according as it had or had not floating dust. Under bell-glasses where the dust had been allowed to settle no fog was produced; where it had not been allowed to do so there would be fog. He therefore surmised that the vapor of water condensed on the free surface afforded by the solid particles of dust to form fog, and that without this dust we would have no fog nor cloud and consequently no rain. From this he passed on to the production of dust for the formation of fog and found that combustion and even heating had a surprising efficiency. By simply heating any substance, as a piece of glass, iron, or brass, a cloud of dust would be driven off, by which would be made a cloud of water-globules in the receiver. So active is this test for dust that if we simply heat a grain of iron wire, it will produce a distinct cloud in the experimental receiver; and if the wire be then simply touched with the finger and again heated, it will be again active as a cloud-producer. Salt proved to be a powerful fog-producer, and sulphur still more so. Gas flames in pure air were productive of large quantities of such dust, and the results with a Bunsen flame, a bright flame and a smoky one were much alike. It would thus seem that the completeness of the combustion does not make much difference and that the cloud-compelling particles were not the smoke but an immensely larger number of finer particles, probably so fine that they escape microscopic detection.

c. Inorganic dusts from natural agencies. Of these are the ash dust and smoke from volcanoes, which are of no practical importance to us. Volcanoes, are too distant in all directions to send us their products. Such dusts of terrestrial origin have however been observed at great distances from their source. Sahara dust is by no means uncommon in southern and even central Europe. It is well known that Ehrenberg found the sliiceous cases of minute South American organisms in dust which had fallen in various parts of the old world.

More general in its distribution and regular in its fall is a sort of fine solid matter now pretty satisfactorily proven to be of meteoric origin. The evidence in favor of its cosmic origin is about as follows; Large numbers of meteors are burned up in the air, and it is probable that particles from them after having been fused, should fall to the ground; such particles, rounded or tear-shaped, apparently cooled from fusion during a fall through the air, are frequently found; they contain native iron, nickel and cobalt,—a meteoric combination of metals; they are often found in places which they could not have reached from the surface of the soil, as on the snow or in ice-pockets in high northern latitudes; they can not be of industrial origin as they are found in older geological formations. About the source of this form of atmospheric dust there can be little doubt. The evidence is very strong; but probably other sorts of minute particles reach us from the same source. They are not, however, so characteristic as the iron dust, and cannot easily be separated from similar substances of terrestrial origin. The recognizable cosmic particles do not form an abundant ingredient of the atmospheric dust as usually collected. It can settle but slowly and great quantities must exist in the atmosphere; occasionally it may descend in considerable quantities, and to it then, we may perhaps attribute the dark days of last year and of a hundred years ago in New England. The color of the sky may also be due to this form of dust.

d. Minute organisms. That they are common in the air is matter of both theory and observation. That fungi spring up wherever favorable opportunity is afforded, though none of their like have been known there before, can only be rationally explained by the theory that their germs must be so abundant in the air that they are omnipresent and ever ready to accept any chance of finding a lodgment. The same facts must be true of a large number of species of animals and plants. Tyndall found that the dust discovered by his exploring beam of light was easily burned up, and was therefore organic. Presumably it is to a great extent made up of the germs of a great many species of animals and plants.

These various sorts of minute particles, taken all together, form an abundant ingredient of the air. Every sunbeam in a darkened room marks its course by such particles. Tissandier has carried on long series of observations on this subject.* He washed out in Paris 0.006 to 0.023 of a gramme of dust per cubic meter of air; in the country, 0.003 to 0.0045 of a gramme. The smallest numbers were observed after a rain when a considerable part of the dust had been already washed out. At the rate at which it is found in the city, it would not take many acres of land to make quite a dust heap in the first ten or fifteen feet. And this need not surprise us when we recall how rapidly dust accumulates in a closed room. But the dust measured by Tissandier is only the coarser fragments—the motes, in comparison with which the particles demonstrated by Aitken, and perhaps many of the organized germs are both much more minute and much more numerous. The abundance of these latter we cannot even approximate; the density of the fogs of coal- and therefore sulphur-burning London can only give us a very rough idea of it.

Now the idea of breathing air so loaded with impurities is revolting. These sweepings of industry, this comminuted scurf of all living things, these offscourings of all creation may play an important part as rain-producers, light-dispensers, fertilizers of our fields, but they are certainly neither agreeable nor wholesome when introduced into our lungs. It is a case where ignorance is bliss, but it is still true that "Cleanliness is next to Godliness." It is a part of the duty of the practical ventilator to deliver us from this plague, and the question arises, can he do it? and if so, how?

Each man carries a ventilating-machine around with him. Nature has placed it immovably in the middle of his face, and has provided it with a thick-set abattis of hair, lined it with a membrane always moist, and has moreover made its entrance passage nearly vertical, thus furnishing it with three simple but effective contrivances for air-purification. Nature has not intended that the opening immediately below this arrangement should be employed for ventilation. It is frequently stated by experienced travelers in the tropics that a mosquito-netting is an excellent miasm-strainer; the older and more frayed it is the better it is for this purpose, and it is best when damp with dew. Both Tyndall and Aitken have found that air passed through a plug of cotton-wool is pure. This is the principle of the mosquito-netting carried further; the working of course being the sifting out of the particles of dust by the fine meshes of the cotton-wool. This plan could easily be applied to house and other ventilation. Probably one or more layers of coarse cotton cloth could be fastened over the fresh air draft without checking the flow of air too much. It is certainly worth trying and may be already a familiar expedient.

The organic portion of the dust can of course be burned and the organisms thus destroyed. But the very burning drives off a cloud of minute particles

* Zeitschrift Oest, Gesell, fur Met., xiv, 191.

from the heated body, and while we eliminate one we introduce another element of uncleanness into the fresh air.

We might also take advantage of the weight of these particles to get rid of them in part at least. Even the smallest of them have weight, and we must admit for all a greater specific gravity than that of the air in which they are suspended. How then are they suspended? We answer the question by saying they are not suspended. The problem is that of the apparent suspension of clouds, and is easily explained. Air adheres to them and decreases somewhat the relative specific gravity of the mass of which they are the center. The adhesion of air to solids and liquids plays quite an important part in nature, but is often overlooked. Plunge a feather into water and it will be found that a surprisingly large mass of air adheres to it, and can only with some difficulty be separated from it. Flowing water carries with it some air, as can be seen by blowing smoke on such a current when the smoke may be seen to follow the stream. Send out a stream of spray from an atomizer over a surface of water, and its globules can be seen to dance along for some time over the surface before they finally incorporate themselves into the mass of water beneath. Each little spherule is coated with a layer of air; the larger the spherule the thinner relatively is the layer of air, and the sooner can it break through this layer to join the water below; the smaller the globule the longer it takes for this to happen. Each droplet element of a cloud, and each mote dancing in a sunbeam has such a coat of air. The mean specific gravity of the mote plus that of the adhering air is less than that of the mote alone. But the two together do not make the mote absolutely lighter than the air around, and we must acknowledge therefore that the suspension of the mote in the air is only apparent; the mote really falls, though if it is small its velocity of fall will be small. A heavy body is accelerated as it falls, but in a light body the resistance of the air soon neutralizes the acceleration; after this happens the fall of the body is uniform and slow.

These particles must fall, why could we not take advantage of this to trap them. When a test-tube is suspended mouth downwards it is soon emptied of its dust contents, and the air in it becomes pure. Experimenters in spontaneous generation have taken advantage of this feature and, through a long narrow tube opening downward, have allowed their solutions to remain open without contamination. In ventilation this principle might be employed by having the fresh air pass up and then down as long a double vertical passage as possible before entering the rooms to be ventilated. If the current through were not too strong the coarse particles would fail to make the turn and would fall back to the bottom; those that passed over would be carried down by inertia and gravity, and would be carried so far as to reach the bottom on the inside. If water were placed at the bottom of such a passage many more particles would be caught, especially if the current were passed immediately over the surface.

The general subject of Ventilation was discussed with considerable interest.

REPORTS OF COMMITTEES.

REPORT OF COMMITTEE ON SANITARY PUBLICATIONS.

Your committee appointed to examine the sanitary publications upon exhibition before the Convention beg leave to make the following report:—

We find presented for inspection some two dozen volumes, covering a broad range of sanitary subjects, and treating topics of both general and special

interest. Many of these are standard works, familiar to all students of Sanitary Science, as Parke's Hygiene, Wilson's Handbook of Hygiene and Sanitary Science, Hufeland's Art of Prolonging Life, etc., and are safe and reliable guides to anyone seeking information upon these important subjects, and suitable both for the special student and the general reader.

A few others commend themselves especially to the practical chemist or purely scientific student engaged in this line of investigation, and are valuable contributions to the special subjects of which they treat. Among these we may number Ekin's Potable Water, and Frankland's Analysis of Water, Naval Hygiene, by Dr. Joseph Wilson, etc.

But it is that class of books addressed to the public and intended for the enlightenment of the general reader that we have regarded it the peculiar duty of this committee to investigate. A body of philanthropists whose prime object is the discovery and dissemination of truth regarding the promotion of the health and well-being of the individual and the community should critically inspect the literature upon the subject that is designed to accomplish this purpose, and such as is sound and valuable should receive its hearty approval and recommendation. Your committee takes pleasure in calling the attention of the members of the Convention to a few books of this character which cannot be too highly endorsed, containing information which cannot be too thoroughly diffused, regarding the proper care of our bodies, our homes and surroundings, and which if adopted in our practices will, by prevention, prove to be the most potent agent at our command in abolishing misery and disease.

Among such books we would classify and recommend The American Health Primers, upon well selected and vital questions, written by our most competent specialists, and published in a neat and attractive form; A Guide to Health and Healthy Homes, by Dr. George Wilson, whose very name, inseparably connected as it is with hygienic truth, is sufficient to commend this work; Drainage for Health, an excellent practical treatise by Dr. Joseph Wilson, upon the best methods of securing thorough draining of our lands and homes; Diseases of Children, by Ellis, a book addressed to mothers and guardians, and intended as a guide to the hygienic care of children both in health and and disease, containing valuable information that every mother should know; Dangers to Health, by Teal, a pictorial guide to sanitary defects, and in this novel and attractive form of illustration well calculated to impress the important facts it contains, especially as regards the disposal of waste matter.

Books such as these will prove powerful aids in awakening attention and inculcating right knowledge, and greatly lessen the labors of our sanitary boards, and their distribution should receive the strongest endorsement from a convention of this character.

And last of all, at least two of your committee would think it a great oversight not to make special and emphatic mention of the publications of our State Board of Health. There is no danger of overestimating the importance to the people of Michigan of the valuable truth furnished them through this source regarding the peculiar dangers that lurk in our midst and the best methods of combatting those influences and diseases dangerous to health. The wise policy which has governed the action of the Board in dealing with local and practical questions, and the liberality with which the facts they have discovered have been placed at the disposal of every thoughtful and intelligent citizen, is already fruitful of excellent results in checking the progress in our

commonwealth of some of the most dreaded diseases peculiar to our climate. We would heartily commend these publications to careful perusal by the citizens of this State in the interests of their individual and our common welfare.

W. J. Herdman,
Henry B. Baker,
V. C. Vaughan.

REPORT OF THE COMMITTEE ON RESOLUTIONS.

Resolved, That the hearty thanks of this convention be tendered to Justice Cooley and Judge Harriman, for the able manner in which they have presided over its deliberations; to Prof. Vaughan, for his earnest and successful labors as its secretary; to the local committee, and to the citizens of Ann Arbor generally for the cordial reception they have extended to the members of the convention from abroad, and for the efforts they have made to secure so successful and instructive a meeting of Sanitarians.

The members of the convention desire also to express to President Angell their appreciation of the courtesy shown by him in inviting them to visit, and in accompanying them through the various departments of the University.

Dr. Russell,
A. Hazlewood,
LeRoy Parker.

REPORT OF THE COMMITTEE ON THE SANITARY CONDITION OF THE HOSPITALS OF THE UNIVERSITY OF MICHIGAN.

To the President and Members of the Sanitary Convention:

Your committee appointed to inspect the "Sanitation of the University Buildings," respectfully submits the following report:

The committee were uncertain at first as to what was contemplated by the appointment. Whether it was expected the committee should go through the University and examine it in all its sanitary relations, or confine their investigations to some particular department, was a matter of doubt. To go through the whole establishment would require more time than was at the disposal of the committee, and they were constrained, therefore, to believe that there was some special purpose intended.

With a view of determining what was the design of the association, the Chairman addressed a note to the President requesting information. He received the reply, that "it was a Committee to inspect the Sanitation of the University buildings"—"I presume that I should be safe in assuming that the mover of the committee had the hospitals specially in view." Accepting this as an expression of the wish of the association, your committee took advantage of the general invitation extended to the members, to visit the University, and where, upon their arrival, they were most courteously received by the President and other officials.

After making a cursory round of several of the buildings, which seemed in every respect all that could be desired, your committee entered upon the special duty assigned, and first directed their attention to the drainage, as this not only had a direct bearing on the hospital, but all other buildings as well.

DRAINAGE OF THE UNIVERSITY AND GROUNDS.

Upon consultation with Mr. Climie, who your committee believe had charge of the laying of the sewers, they readily obtained all the information desired in respect to the size, construction, grade, etc., necessary to a general understanding of the subject.

This inquiry elicited the fact that an adequate system of drainage has been established on a plan which is quite excellent in general design, but which they think has some defects in details that need attention to obtain the full advantage of what has already been done, and avoid future trouble and expense. It is proper to remark that whatever is done in this direction should be as permanent as the great institution of which it is an adjunct, and that it shall be adequate to meet all the demands which may be made upon it for a long series of years. But for these considerations the committee would have little to offer.

The system, as now planned and executed, consists of a main sewer, of 10 inches in diameter, leading from a man-hole in the University grounds to the bluffs on the Huron river, distant about one mile; and from the man-hole referred to, are several branches radiating to the college buildings, laboratory, hospital, and to some private residences. These branches vary from six to eight inches in diameter, and are designed to carry off the sewage from the buildings and the storm-waters which fall on the several roofs. There is also a six-inch ventilating pipe running from the man-hole where all the laterals join to the smoke-stack of the engine-house, a distance of several hundred feet. This is the only special ventilating flue, or means of discharging gases from the several sewers that has been provided, but it is a part of the design to utilize the rainwater conductors on the buildings for this purpose.

For cleansing the sewer pipes reliance is had upon the storm waters falling on the buildings, and the discharge daily of about two hundred barrels from the chemical laboratory. It was believed that the chemicals thus thrown into the sewer would be sufficient for the disinfection of the whole line.

At present the sewers seem to be acting well enough, as far as your committee could ascertain, but they are of the opinion that within a comparatively short time, unless some additional means for ventilation and flushing are provided, they will become sources of great annoyance. The water from the laboratory will probably be sufficient to keep that branch in very good condition, but it can certainly have no effect upon the other branches, nor but little upon the joint discharge through the main sewer to the river. For the other branches storm waters are relied on alone to keep them clear. In this respect we are of the opinion that there is a serious mistake. It will be observed that the grade is less than one-half that which a large experience in this country and in Europe has demonstrated to be necessary to obtain such a rapidity of the current as will keep pipes of twelve inches or less, in diameter, in good condition, and prevent them from filling up with various matters that will unavoidably find their way into all drains and ultimately close them, or so nearly as to render them useless. Once in this condition, nothing short of taking them up, cleaning, and relaying will answer, all of which, of course, entails considerable expense.

And again, when we consider that the refuse thrown off from the dissecting rooms of the medical college is large in quantity and subject to rapid decomposition, and the further discharge from the hospital wards of a very similar character, we think we are justified in the expression of an opinion that imme-

diate provisions for the more effective flushing of the sewers should be made on a comprehensive basis, and that ventilating flues should be provided at the proper termini of the branches; these flues to reach above the roofs of their respective buildings. It is possible that the ventilating flue running to the engine-house may answer for the main sewer, but little more need be expected. The committee have doubts, however, as to its efficiency for this, more especially when the wind shall be blowing into the outlet of the sewer, thereby forcing all the gases generated along its entire distance into the upper end, there to be distributed throughout its several branches. It is not possible for an aspirating flue, under existing circumstances, with a cross-section of thirty-six inches to carry off the gases generated in a sewer a mile in length with a cross-section of one hundred inches, to say nothing of the necessity for the ventilation of the connecting branches, every one of which has a capacity equal to, or larger, than this flue, nor of the rapidly diminishing efficiency of an aspirating force applied at a point so remote.

The best sanitary engineers are agreed in the expression of the opinion that every sewer and sewer-pipe should have a ventilator of its own.

All future trouble, however, may be avoided by the construction of flushing tanks at the head of each line, which may be designed to work automatically or by personal control. An automatic tank in the laboratory would not only insure more perfect cleanliness in that sewer pipe, but would add greatly to the effect of the large amount of water discharged therefrom into the main line in clearing it.

Under existing circumstances your committee are of the opinion that too much reliance is had upon the flow from the laboratory, to keep the main line in a proper condition for any great length of time. Assuming that the discharge equals 200 barrels daily, and that the greater, or we may say the whole of this passes off in eight working hours; then this will give a stream in the eight inch pipe of a depth of about seven-eighths of an inch only, while in the main line the depth will be less than three-fourths of an inch, in a fall of nine inches in 100 feet. Of course it will be deeper, as in this instance, where the fall is less, but there will be a corresponding diminution of the rapidity of the current and greater liability for accumulations to take place.

When we consider then the large amount of offensive matters which must be carried off by this water below where the pipe joins the main line, and these too of a character to contaminate speedily the whole distance and all connections, the necessity for a more thorough, regular, and frequent flushing becomes apparent. Sanitary engineers are agreed that no reliance should be placed on storm waters for such purposes. It is too uncertain, often inadequate; in the winter when the conductors are filled with ice and snow, a nullity; while they may, and often do, become the means of forcing the gases up through the traps into the buildings. This is especially true when the direction of the wind is against the mouth of the sewer, whereby the air along the whole length is driven out at the upper openings, while the water from the roofs creates a down cast in the conductors, and at the same time fills the sewer pipe, and to that extent lessens its capacity. As the cost of a flushing tank for the utilization of the waste water would be a trifling matter, the benefits arising therefrom will be more than ample to repay it.

The necessity for flushing, independently of the rain-fall, is clearly recognized in the system established in the city of Memphis, where the pipes are of the same dimensions as these under consideration, but with much steeper

gradients, and where over 120 tanks have been introduced. To insure results Rawlinson says "there should be a flushing chamber at the head of each sewer and drain, and every flushing chamber should be permanently ventilated;" and his views are confirmed by Hering, Morin, and Waring, as well as many others.

Such tanks should be of sufficient capacity to fill a sewer pipe fully 100 feet in length under a pressure of five feet head, and the outlet from the tank should be slightly larger than the pipe into which it discharges in order to secure the full scouring effect of the rapid flow and the pressure.

Again, a flushing gate should be introduced into the main sewer some distance from the head, so that advantage can be taken of heavy rainfalls whereby all the connecting pipes and the main may be filled to their full capacity, when by opening the gate the long line to the river may be thoroughly cleaned. Frankfort-on-the-Main has adopted this plan with the best results. Rawlinson holds that every man-hole should be a flushing chamber, but in this case the flushing gate should be several hundred feet further down in order to obtain suffcient force to carry off all the obstructions.

An instructive experience in respect to the flushing and ventilation of sewers has been had quite recently at the post of Fort Wayne, Michigan, where the conditions are very similar to those under consideration. The sewer pipes are of the same size, laid in the same manner, and reliance is had on the storm waters falling on the buildings for keeping them clean, and the rain-water conductors for ventilation. These means of keeping them in good condition are a failure. They had scarcely been laid a year when they became intolerable. Last summer the chairman of your committee made a report to the commanding officer that immediate measures should be taken to ventilate them, and flushing tanks, or their equivalents by turning on the hydrants daily, for cleaning them, should be provided.

A square shaft nine inches in diameter and 40 feet high was placed over the sewer near the mouth on the river bank, which has improved the condition greatly, but it is not sufficient. The post surgeon advised a ventilating shaft of not less than 12 inches, and better, one 15 inches in diameter, in order to make a strong draft the whole length of the main line and branches; but as he did not have control of the construction, only half measures were adopted. The relief, however, that this tentative shaft has afforded has been such that now estimates have been made and sent forward for a suitable ventilating shaft and flushing tanks of permanent construction, and when built the system will be complete.

The sewer lines at Fort Wayne are less than one-eighth the length of those at the University, and if difficulties of the kind stated arise there so soon, and where the quantity of storm-water falling one inch in depth on the roofs of the buildings amounts to over 450 barrels, it is fair to infer that analogous conditions at the University will lead to like results.

The grade of these sewer-pipes, if your committee are not mistaken, is about 4 inches in a hundred feet, or in the ratio of 1 to 300, except as to the lower end, where the fall is very much greater, hence, as before remarked, much less than that generally deemed necessary in this mode of drainage; but the flushing tanks will remedy this, if so arranged as to give not less than 5 feet head, although 8 or 10 feet would be better. Good vitrified pipes will stand this pressure without danger of bursting, and in this respect your committee are assured that not only are the pipes of the first quality but the joints are

laid in the best hydraulic cement and with thorough workmanship. It is clear, therefore, that no danger need be apprehended in making use of the pressure obtained from tanks located above the surface of the ground near the respective buildings.

In regard to the ventilation, we are of the opinion that it is not such as to secure immunity from the effects of deleterious gases in the sewers, more especially when the winds are from the direction calculated to force the air up and out at the higher openings.

The remedy for these defects is easy and inexpensive. Pertinent to this part of the subject, the committee invite attention to the remarks of Surg. J. S. Billings, U. S. A., at a recent sanitary meeting in New York. The substance of what he said is, that by placing ventilating conductors just beyond the traps, so as to secure a free passage of air from the sewer pipes to a height a few feet above the roofs of the several buildings all the danger is removed, in so far as the escape of gases through the traps is concerned, provided they are kept full; but if the water in the traps, by reason of evaporation, leakage, or other cause, is insufficient to close them completely then the danger is not wholly removed, and the remedy lies in a ventilating shaft at, or near, the mouth of the sewer, of a sufficient height to create a good draft and a free interchange of air, like the arrangement at Fort Wayne,—when it may be claimed that every provision has been made for a perfect system. When the wind is blowing at a moderate velocity the aspiration by syphonage is very strong, and a flue 16 inches in interior diameter will discharge more than ten times the amount of sewer air that the present six-inch flue leading to the smoke-stack of the engine-house will do in a given time. This is readily shown by the arrangement at Fort Wayne.

HOSPITAL AT THE UNIVERSITY.

Proceeding to the examination of the hospital, your committee were deeply impressed with the insufficient ventilation the moment they entered the main wards. Indeed, it was such as to remind one very forcibly of the condition of the military hospitals in the earlier years of the late war. A very few inquiries, however, showed that the causes of this state of things were not due to any want of proper management. The errors lay in the defective construction of the buildings, and, in this respect, it was only too apparent that no degree of professional skill or executive ability could keep the wards in a healthy state with the means at command.

These remarks may seem rather severe, but a little examination of the subject will show that they are fully justified.

The hospital is built of wood on the pavilion plan, one story in height, without basements, except in the eye and ear wards, and consists of two main wards—one for males and one for females—each 94 feet long, 30 feet wide, and 16 feet high, giving a capacity of 45,120 cubic feet, and designed for 25 beds, each with an allowance of air space of 1,805 cubic feet. The eye and ear wards are 19 by 19 feet, inside measure, by 17 feet in height, each containing 6,137 cubic feet, and designed for three beds, with an allowance of 2,046 cubic feet space.

There are several small rooms for one bed only, an officers' reception room, ampitheater, kitchen, and the necessary closets and bath rooms, all of which are indicated by the accompanying diagram, kindly furnished by the Hon. A. Climie, at the request of your committee.

The ventilation of each of the main wards consists of two brick flues 18x24 inches, located respectively at about twenty-four feet from the ends of the wards and in both of which there is a small coal-grate 18 inches wide with a chimney throat of four inches, and a register two feet from the ceiling, each 12x18 inches.

The original design was to have 22 ventilators in the floor connected with flues running up the walls and joining these ventilating shafts above the ceilings by suitable conductors, but this arrangement was never carried out.

The heating is by direct radiation from steam coils in the wards, together with the coal grates referred to; and the fresh air is admitted from beneath the floor by openings through the foundation walls and passed over the steam coils as it enters the wards.

For heating and ventilating the eye and ear wards a very much better arrangement has been provided, and this was apparent on entering them. They are warmed by indirect radiation, from steam coils located in brick chambers, situated beneath the floor, at either end of the building, and the hot air is distributed at ten judiciously separated inlets by a corresponding number of conductors, each 10 inches in diameter, made of galvanized iron. The foul air is removed by two open fire places and 10 foul-air floor registers, and an upper register near the ceiling for each room, to be used when the wards are over-heated. These foul-air ducts all connect with a chimney divided into three flues with a steam coil in the center below the floor for creating a draft, and when steam is shut off, open coal fires in the grates are relied on. In warm weather gas burners in the chimneys produce the aspiration.

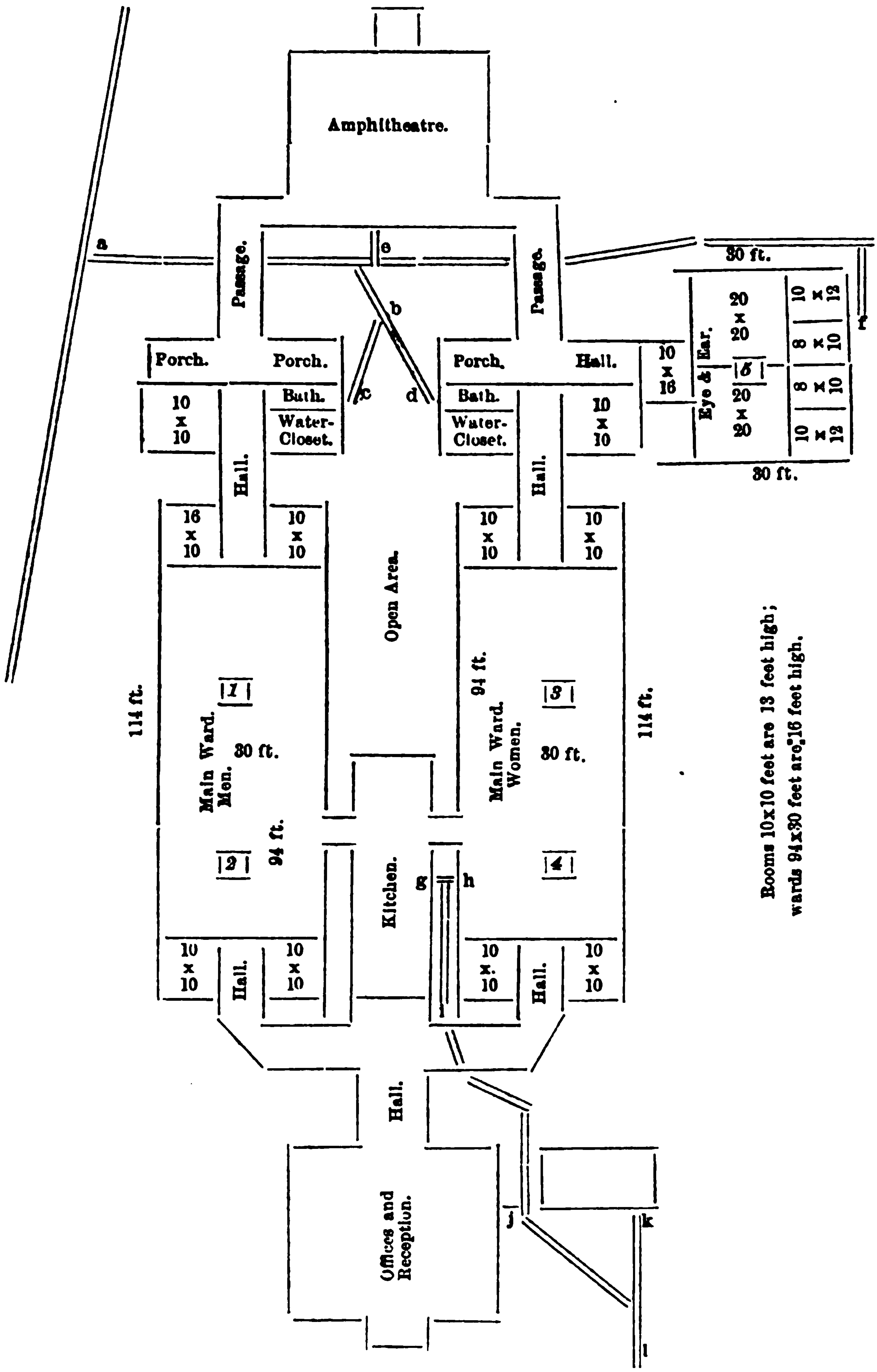
The water closet was ventilated by a tin conductor leading to the large shaft, and all these appliances seemed to be working in an excellent manner.

The supply of fresh warm air in these wards was abundant and the condition as a consequence in marked contrast to the others we had previously visited.

To return to the ventilation of the main wards. The rule laid down by sanitarians in respect to the supply of air, is, that the amount allotted to each bed should be changed three times every hour; this would require for each bed 5,415 cubic feet, and for the entire ward 135,375 cubic feet of air for that period of time.

The capacity of the present, or rather we should say the incapacity of the present arrangement, to remove this amount of air may be judged of by a very little calculation. The throat of the coal grate flues is about 4x18 inches, and the velocity of the air in this passage with a brisk fire is estimated by engineers at from six to seven feet per second with the chimney 30 feet in height. Taking the highest rate as a basis of calculation, we find that the amount carried off by each shaft through the grate flues to be about three and one-half cubic feet per second, or 210 cubic feet per minute, and with both shafts the amount to be 420 cubic feet. The velocity in the flues above the grate on the given sectional area of 440 inches is about one and one-sixth feet per second. To this must be added the amount discharged by the ventilators near the ceiling. The velocity of the discharge through these may be considered as equal to that in the flue, viz., one and one-sixth feet per second, and the two registers, each 12x18 inches, deducting one-half for impediment to the flow by fretwork and valves, will then carry off one and three-fourths cubic feet per second, or 105 cubic feet per minute; making an aggregate discharge by both shafts of 31,500 cubic feet per hour. These data show that it requires nearly four and one-third hours to change the air three times in a ward by these ventilators.

PLAN OF UNIVERSITY HOSPITAL.



Scale—50 feet to 1 inch.

a, b, c, and other letters, refer to the house-drainage and sewerage, as follows:—

a. Connection with main sewer.

b. Connection to closets.

c and d. Hand-hole trap connection to closets and water-conductor runs into top of trap.
e. Connection to sink in amphitheatre and to water-conductor.
f. Connection to closets and water-conductor into top of trap.
g and h. Connection with water-conductors.
i. Grease trap for kitchen.
j. Connection with sink in basement with hand-hole trap.
k. Connection to be made to closet with vault. These sewer-connections with water-conductors for flushing and ventilation of sewer.
l. Connection with main sewer.

1, 2, 3, 4. Chimneys with fire-places and registers in side of same two feet from ceiling. These chimneys were originally for ventilating-flues connecting with ducts running along the side of the wards and lateral flues crossing from either side between joists to the said chimneys; 22 floor registers. To these ducts the fresh air was let in by small iron grates in foundation walls. In some of these openings brick have been placed and the lateral flues from side of wards are filled up. The capacity of the actual ventilation for these wards thus shown is four chimneys, *1, 2, 3, 4,* two in each ward, about 440 square inches. The original plan seems never to have been completed.

5. The Eye and Ear Ward, *5,* 30x40 feet, is warmed by indirect radiation, steam-coil in brick chamber in either end of building. Hot air distributed at 10 different points by ten 10 in. by 10 in. galvanized iron ducts. Foul air removed by two open fire-places and at 10 foul-air floor registers, and an upper register for each room to be used when rooms are overheated. These foul-air ducts all connect with chimney divided into three flues with steam coil in center below floors. When steam is not on, open coal fires produce draught in warm weather. Gas burners in chimney give like currents to the air. Respectfully,

ANDREW CLIMIE.

The present means of ventilation, it will be seen therefore, is barely sufficient for five beds, to say nothing of the twenty-five beds dependent thereon.

No one could be more cognizant of these deficiencies than the members of the faculty in charge; and their representatives took occasion to say to your committee at the outset, that they were in no sense responsible for the condition of the wards as we found them; that the wishes of those in charge had not been considered in the construction, nor had their recommendations or representations of the great necessity for radical measures of relief, accomplished anything in that direction. It is not pertinent to the object for which your committee was appointed, however, to enter upon any discussion as to the responsibility for these errors of the plan and construction. They are to take things as they find them, and speak of them as they exist; and with all deference, to suggest such remedies as to them seem necessary to advance the interest of all concerned.

To begin, then, your committee wish to say that in all its plans, appointments, conveniences, and methods of administration, the hospital department of the University should hold a foremost position, not only in relation to similar schools of instruction in this country but in every other. Nothing that science and skill can afford should be wanting in order to make it a means of instruction for students in the best modes for the treatment of disease, and an exemplification in its construction and executive application of those fundamental principles of sanitary science which relate to every public institution or private dwelling in order to secure health and comfort. It should be an edifice for the demonstration of sanitary principles, both in plan and detail of construction, that students may learn of it those preventive measures, and the remedies for many fruitful causes of disease. If it be less than all this, it falls short of its mission.

With these objects in view your committee feel constrained to say that the original design for ventilation was defective, and even if carried out in all its entirety it would not have answered the purpose fully. A primary defect was the admission of the fresh air through openings in the basement-walls and

thence, through floor registers to the heaters standing in the ward. On the windward side air would enter more freely than on the opposite, and the room on that side be imperfectly warmed, and if the wind pressure were considerable, as is not unfrequently the case in cold and stormy weather, a downcast would take place through the leeward flues and much of the heat be lost on that side.

Another defect consisted in the location of the inlets for fresh air, and the outlets for foul, at or near the floor, thereby failing to provide for a suitable and even distribution of the circulation in the wards. Other faults in the plan might be pointed out if it were necessary, among which, the unsightly and inconvenient ventilating stacks standing at present in the wards, might be included.

But in this connection it may be said, that any system of ventilation is defective that does not provide for the absolute control, at all times, by the executive management, of the quantity, distribution, removal, temperature, relative humidity, and purity of the air admitted, no matter what may be the direction or force of the wind, or what may be the temperature or humidity, in the most extreme ranges of the year. And it may be considered a matter of congratulation to the sick that modern science, invention, and skill have now placed the attainment of these desirable ends within easy reach and at a very moderate expense, so that every public institution may have them.

The best plan for warming hospitals is that of heating a large body of air by direct steam or water radiation in the basement to a few degrees above thatrequired for the ward and distributing the same to each bed by floor registers.

The Johns Hopkins hospital at Baltimore, the Soldier's Home hospital at Washington, the new Military hospital at Governor's Island, New York, and others in this country have adopted this method; and it is the one recommended by Dr. F. De Chaumont, Professor of Hygiene in the Royal Army Military school at Netley, England, with the removal of the foul air from near the ceiling; while Arthur Morin, Director of the Conservatory of Arts and Trades, Paris, advises basement heating but the carrying of the warm air to the ceilings of the ward and having the exhaust openings in the walls near the floor in the immediate vicinity of each bed. As to the details in this respect, sanitary engineers are not agreed, but they are quite so in the amount of air to be supplied, and in the necessity for frequent changes. If the diffusion of carbonic acid gas be taken as measure of contamination of hospital air then it would seem that the recent investigations of Aristide Beaud would settle the question as to the propriety of having the exhaust near the ceiling and the inlet near the floor. But whatever method be adopted the rules laid down by De Chaumont should be kept constantly in view, viz:

"That fresh air should reach every patient without passing over the bed of any other."

"That the vitiated air should be removed from each patient without passing over the bed of any other."

"That the air should move at no greater rate in the ward than one and one-half feet per second."

"That at the inlet the rate should not exceed 5 feet per second, and at the outlet not more than 7 feet.

"That these openings should have a sectional area not less than 64 inches

as a minimum;" which rules have been followed in the construction of one of the newer hospitals in Edinburgh, Scotland.

To these, however, may be added another, viz: that no dependence should be placed on window ventilation in any season of the year, for, remarks an eminent authority, "this is never well done, is unequal, and often highly objectionable to some patients."

The arrangement of the Johns Hopkins hospital may be accepted as the most complete in its ventilating appliances of any institution in this country, and quite equal to any in Europe.

In respect to this, Dr. Billings, who furnished the plans, states: "The common wards of the hospital are one-story buildings having basements ten feet in hight. These basements are occupied only by heating apparatus, being large, perfectly clean air chambers. The heating is effected by hot water. The ventilation is arranged to furnish one cubic foot per second for each patient at any temperature desired under ordinary circumstances, with a possibility of doubling this amount. The power for this purpose is an aspirating chimney to each ward, and a large fan for the whole."

A large reservoir of moderately heated air, and this preferably located beneath the ward for convenience and readiness of distribution to every bed alike, is now regarded by a very considerable majority of sanitary authorities as the most economical and in all respects the best. A demonstration of this is seen in the present ventilation of the eye and ear wards.

Morin calls attention to another advantage in the use of clean and dry basements for ventilation in the summer season, and which deserves consideration in any plan that may be adopted. By actual observation he shows that the air admitted from this source in warm weather is from 5° to 7° colder than the outer air, and hence far more agreeable to the inmates of hospitals and dwellings. But more than this may be attained very easily by the employment of the modern refrigerating machines whereby the temperature of the inlet blast may be cooled to any required degree for comfort in the most fervid summer heats, and at the same time the per cent of humidity be reduced in a far greater relative extent.

This question of cooling summer and tropical temperatures to far more agreeable conditions, not only for hospitals but other public buildings and the better class of private residences, has not received that consideration hitherto by sanitary engineers which it deserves. It is beginning to take a practical shape, however, in many places, notably in a New York theater, where all the air admitted to the auditorium is passed through a cooling chamber and the temperature reduced to such a comfortable degree that at the close of the entertainments it seldom reaches 80° in any part of the room. A feeble and ill-considered effort was made in the same direction to cool the air in the White House during the illness of the late President, and it succeeded tolerably well but by no means to the extent which is within the possibilities for well arranged hospitals.

Again, there are vast store-rooms connected with the breweries and packing houses in Chicago, Milwaukee, St. Louis, and Louisville, where the temperature is kept below 40° the summer through; and in the process of brewing, too, artificial refrigeration is in general use.

Up to within three or four years ice has been solely employed for these purposes. Since then, however, machines have been invented which have entirely superseded ice wherever set up, and they have been found to be more econom-

ical than ice at seventy-five cents per ton. Indeed, to that degree have these appliances been perfected that less than two pounds of coal will reduce the temperature of 3,000 cubic feet of air fifteen degrees every hour. There is not much of the time, however, when so great a reduction will be needed for all hospital purposes, and taking the average through twenty-four hours the consumption of fuel would not exceed one-fourth of a pound per hour in order to keep the temperature around each patient in a satisfactory condition.

But even this expenditure would be made up very largely by utilizing the exhaust steam in the ventilating shafts as an aspirating force, so that no objection on the score of expense can reasonably lie against these means of contributing to the sanitary condition of hospitals and all other public establishments. They are simple in construction, easily managed by a person of ordinary intelligence, while the incidental expense of their maintenance, aside from superintendence and fuel, will not reach five dollars per month for a hospital the size of the one now under consideration.

More than this, in the New York theaters where ice is used the air becomes more damp in consequence of the evaporation, but with these machines the moisture is condensed very greatly, thereby purifying the air and promoting the healthfulness of the wards. As a rule the relative humidity in the summer season is very considerably greater in the hospitals than in the surrounding air, but with these devices the relative humidity is under perfect control. The chairman of your committee is personally acquainted with the merits and durability of these machines and can testify to their excellence. By their aid all the conditions for perfect ventilation and absolute control of this by the executive management are fulfilled, so that as the temperature and humidity may be increased at our pleasure, so may we reduce these quite as easily to any required extent. In some of the establishments in the cities referred to, storage in the aggregate ranging from 250,000 to 1,500,000 c. f. of air space, perfectly dry ventilation is obtained, and the temperature kept within four or five degrees of freezing from the beginning of the year to its end without difficulty; and the means which accomplish this are perfectly applicable to hospital sanitation.

It has been urged in extenuation of the continuance of the present arrangement for ventilation, that no evils have been observed growing out of it; and that the statistics compare favorably with any other similar institution in the country. All this may be readily granted as a well-deserved compliment to the eminent skill and ability of the faculty, but it does not touch the real question in issue. It is not what has been done with the means in hand, but rather what can be, and should be done with those which modern science and experience have demonstrated to be necessary in order to attain to all which may come within the range of human possibilities, and that the light of modern science and skill may not be obscured by such surroundings as we now see.

To meet the views of your committee several changes would be required. Basements would have to be excavated, substantially walled up, and the whole interior coated with asphalt in order to exclude moisture and terrestrial exhalations. In this should be placed the heating-apparatus. The present ventilating-flues should be removed from the wards and one or two others provided outside with which all the ventilating ducts should be connected. A single shaft, located midway between the buildings, with a vertical partition to divide the interior into two flues and each of these being appropriated to one ward, and the shaft carried to the hight of not less than 75 feet, would be more eco-

nomical and effective in removing foul air than the present mode can possibly be, and at the same time relieve the wards of their unsightly appearance. With these changes there should be a complete modification of the original designs for the ingress and egress of the air so that it shall be admitted to and removed from all patients alike, and the liability for the accumulation of what is called "dead air" prevented. There should be one or two direct radiators in each ward for cases where the vital heat is greatly lowered as in those which are known as "collapse temperatures" when greater surrounding warmth is needed than would be proper for other patients, while a register should be provided for the admission of cold air direct to meet the demands of asthmatic cases in which ordinary hospital temperatures are not unfrequently very oppressive.

The changes suggested by your committee are not very elaborate, complicated, or expensive, and they are such as experience in the management of public institutions has demonstrated to be practicable and effective.

They are also of the opinion that no unnecessary delay should be had in putting them in operation. The present arrangement must be of necessity a source of vexation to the faculty; it is of little account to those patients who are not in the immediate vicinity of the shafts, and is in no sense creditable to the University.

All of which is respectfully submitted.

M. K. TAYLOR, M. D., U. S. Army.,
BELA COGSHALL, M. D.,
U. M. LAWTON.

SANITARY CONDITION OF GRAND RAPIDS.

The following letter from Dr. Mello Veenboer, of Grand Rapids, Michigan, was read to the Convention:

To the Sanitary Convention held at Ann Arbor:

At the Sanitary Convention held at Grand Rapids in February, 1880, by the State Board of Health, the report of the local sanitary condition of the city showed alarming figures. Seventeen victims of diphtheria were sacrificed monthly in a population of about 30,000, that being about 42 per cent of all cases reported. The interesting exercises of the above-mentioned convention bore fruit in a general increased interest in sanitary work and the formation of a local sanitary society. A report of the condition and work of the Society will undoubtedly be given to this Convention in official form, and I only beg leave to offer some comparative statistics of sanitary work by the city officials before and during the existence of our association. Expenses for grading, cleaning, and improvements of streets and gutters has only a partial sanitary bearing, and so has the extension of water-mains, which have been laid principally for fire protection. We must attach, therefore, the greatest importance to the extension of sewers. Our city surveyor stated, "The necessity for sewerage arises from three distinct causes: 1. From the fact that in all communities it is of vital importance that the fluid and feculant refuse of dwellings, the sewage, be disposed of or removed. 2. That in certain cases the thorough drainage of the subsoil, the removal of the ground-water, is of paramount importance to the health of the district; and, 3. From the necessity of providing means of escape for the surface water of storms." For the above purpose then the city of Grand Rapids furnishes us the following statistics for

the years 1879, 1880, and 1881. During 1879, the year before the Sanitary Association was organized, she spent for sewers, $11,565.98; she lost with diphtheria, 139 (membranous croup excepted). During 1880 she spent for sewers, $14,965.41; during 1880 she lost with diphtheria, 105. During 1881 she spent for sewers, $68,784.00; during 1881 she lost with diphtheria, 111.

The accompanying diagram* represents the number of deaths from diphtheria in Grand Rapids, by months, in 1879, 1880, and 1881, and also by periods of age of decedents.

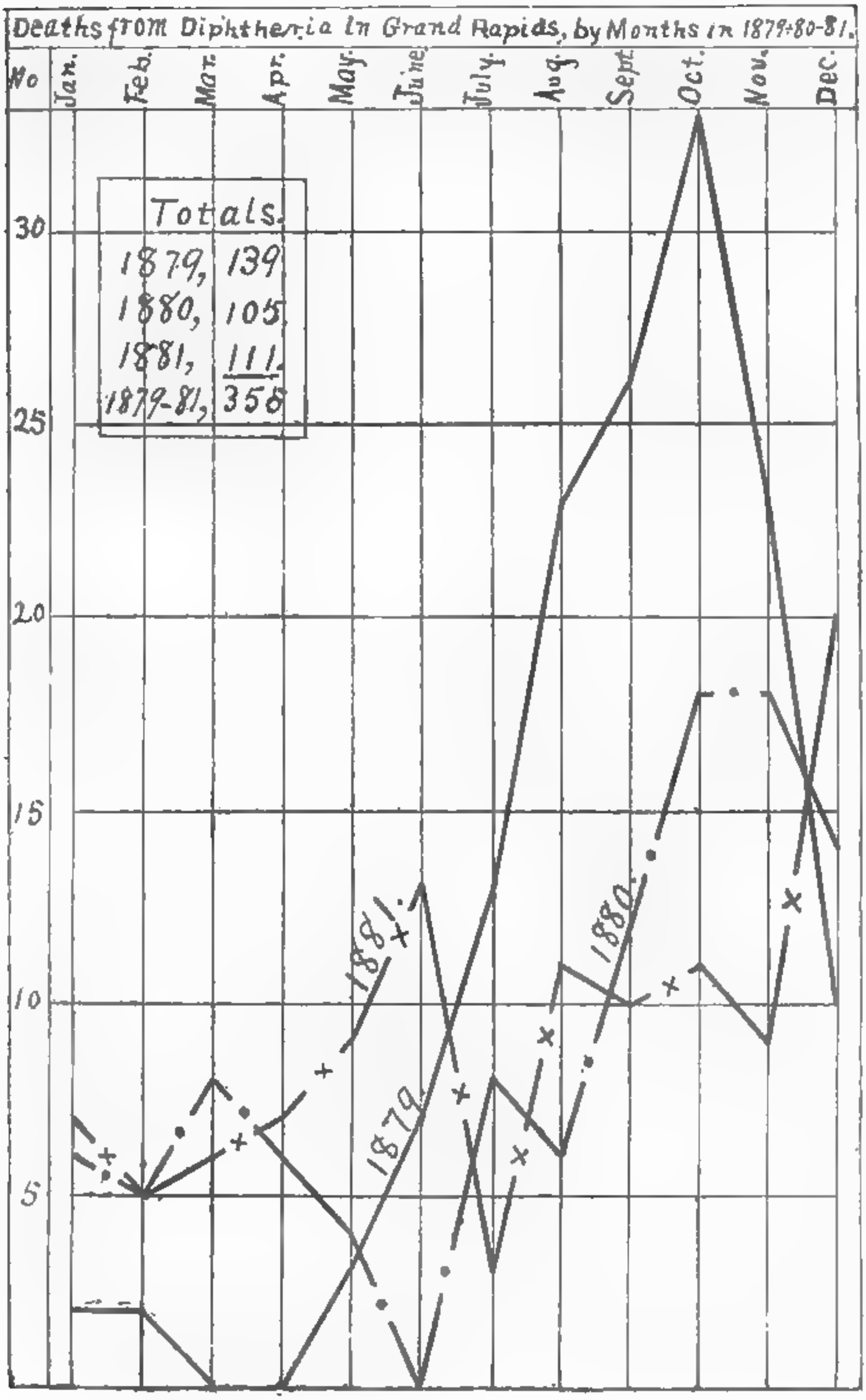
Regretting my absence I respectfully submit the foregoing.

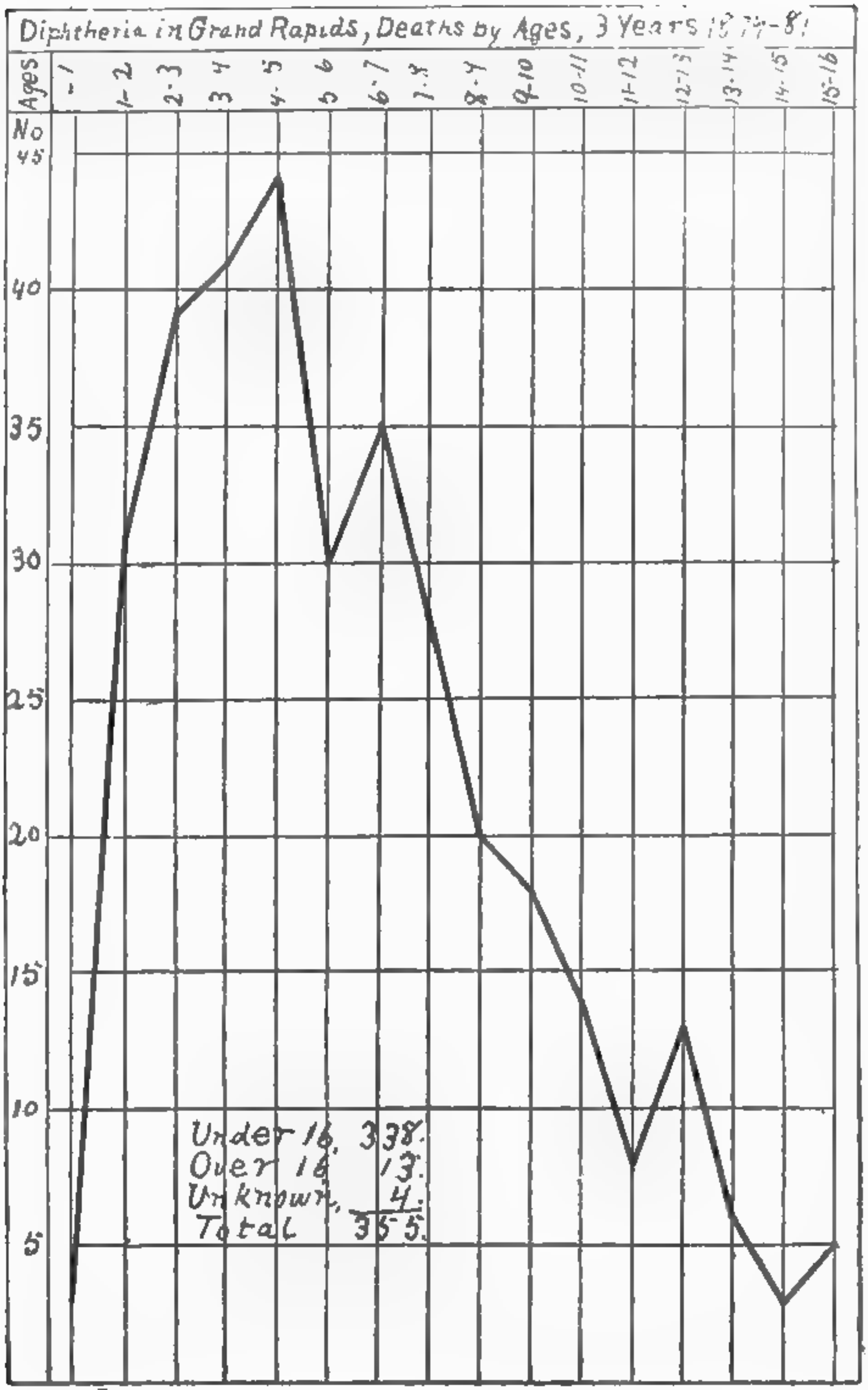
M. VEENBOER.

The convention then adjourned.

VICTOR C. VAUGHAN, *Secretary*.

*[In order to make the diagram comparable with others in this volume, it has been re-drawn on a slightly different plan, and separated into two full-page diagrams which immediately follow this page. Two facts shown in these diagrams are very prominent, and worthy of notice, namely the large proportion of the deaths which occurred in the Autumn months, especially in the year 1879, and the very great proportion of young persons among the decedents, especially at the ages between one and seven years, the greatest number at any single age being at the age between four and five years. Nearly all the decedents were under sixteen years of age—H. B. B., SEC. OF S. B. OF H.]


Deaths from Diphtheria in Grand Rapids, by Months in 1879-80-81.
No
Jan.
Feb.
Mar.
Apr.
May.
June.
July.
Aug.
Sept.
Oct.
Nov.
Dec.
Totals.
1879, 139
1880, 105
1881, 111
1879-81, 355
30
25
20
15
10
5
1879
1880
1881


Diphtheria in Grand Rapids, Deaths by Ages, 3 Years 1879-81
Ages
-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
15-16
No
45
40
35
30
25
20
15
10
5
Under 16, 338.
Over 16, 13.
Unknown, 4.
Total 355.

PROCEEDINGS AND ADDRESSES

AT THE

SANITARY CONVENTION,

HELD AT

GREENVILLE, MICHIGAN,

IN THE

Congregational Church, April 11 and 12, 1882.

SANITARY CONVENTION AT GREENVILLE.

For this convention the following announcement was issued:—

SANITARY CONVENTION AT GREENVILLE, MICHIGAN, UNDER THE AUSPICES OF THE STATE BOARD OF HEALTH.

In accordance with invitation received from citizens of Greenville, arrangements having been made by a local committee of citizens of Greenville, acting with a committee of the State Board of Health.

TIME AND PLACE.

You are cordially invited to be present at the sessions of a Sanitary Convention which will be held in the city of Greenville, Michigan, on Tuesday and Wednesday, April 11 and 12, 1882.

SESSIONS.

There will be sessions the first day at 2 P. M., and 7:30 P. M.; on the second day at 9:30 A. M. 2:30 P. M., and 7:30 P. M.

At each session of the Convention there will be addresses or papers on subjects of general interest pertaining to public health, each paper to be followed by a discussion of the subject treated.

OFFICERS OF THE CONVENTION.

The officers chosen are as follows:
President—Rev. J. L. Patton, Greenville.
Vice President—Hon. E. H. Stanton, Ionia.
Vice President—Rev. A. A. Brown, Greenville.
Vice President—Hon. H. H. Hinds, Stanton.
Vice President—Charles P. Bigelow, M. D., Big Rapids.
Vice President—Hon. J. P. Shoemaker, Amsden.
Vice President—Hon. R. C. Miller, Greenville.
Secretary—Charles S. Sheldon, M. D., Greenville.

EXHIBITION OF SANITARY APPARATUS.

Manufacturers of sanitary apparatus or appliances, and dealers in the same or in any article conducive to health, are invited to send samples of their wares for exhibition at this convention, in accordance with the following regulations:

(a) The committee reserves the right to decline any article not deemed suitable.

(b) A full description of each article proposed to be exhibited must be forwarded to the Secretary of the convention with the application for space.

(c) There will be no charge to exhibiters for entrance fee, for floor-space, or for wall-space.

(d) Exhibiters will pay all expenses of transportation, storage, placing, and removal of goods, and must themselves be responsible for any breakage or damage to their wares.

(e) Every article, model, drawing, or photograph exhibited must bear a descriptive label giving a detailed statement respecting its construction, use, and the price at which the article described can be furnished, and the name and address of the agent, and place of sale.

(f) Exhibiters may employ agents to explain their exhibits, and in a proper manner to solicit orders.

(g) The position in the hall, of articles entered by each exhibiter, will be determined by the secretary of the convention.

(h) Exhibits will be received by the secretary of the convention until April 10, 1882, and will be placed in the hall before the opening session of the convention.

Judges will be appointed to examine the various articles on exhibition, and certificates of merit will be awarded to such articles as are deemed worthy.

Records of the proceedings of this convention and some of the addresses and papers will probably be published in the Annual Report of the State Board of Health.

ADMISSION.

The admission to all sessions of this convention will be free, and the public are cordially invited. Programs for the sessions of the convention will be issued at an early day.

ADDRESSES AND SUBJECTS TO BE PRESENTED AND DISCUSSED.

1. Welcoming address, by the mayor, Hon. Rufus F. Sprague.
2. Address by the president of the convention, Rev. J. L. Patton.

Among the subjects which it is desired to have presented and discussed are the following:

1. The Prevention and Restriction of Small-pox, Diphtheria, and Scarlet Fever.
2. The Present and Prospective Water-supply of Greenville.
3. The Disposal of Decomposing Organic Matter.
4. Pure Air; Why we should have it, and How we shall get it.
5. School Hygiene.
6. The Relation of the Newspaper Press to Sanitary Reform.

The papers read are expected to be original contributions, which when read are to be considered the property of the convention, and to be left with the secretary.

COMMITTEE FROM THE STATE BOARD OF HEALTH.

Rev. D. C. Jacokes, Pontiac; J. H. Kellogg, M. D., Battle Creek; Henry B. Baker, M. D., Lansing.

LOCAL COMMITTEE.

Prof. E. P. Church; James Mulhern, M. D.; Hon. T. J. Potter; C. M. Martin, M. D.; Rev. E. W. Flower; James Satterlee; E. F. Grabill; Rev. Jay Huntington; Hon. S. R. Stevens.

SUB-COMMITTEE.

C. M. Martin, M. D.; Prof. E. P. Church; Charles F. Morgan, M. D.; Charles S. Sheldon, M. D.

Further information may be obtained by addressing the secretary.

CHARLES S. SHELDON, M. D., *Secretary*,
Greenville, Michigan.

PROGRAM OF THE SANITARY CONVENTION TO BE HELD AT THE CONGREGATIONAL CHURCH, GREENVILLE, MICHIGAN, TUESDAY AND WEDNESDAY, APRIL 11 AND 12, 1892.

First Session.—Tuesday, April 11, at 2 P. M.

1. Convention called to order by the Secretary.
2. Prayer—By Rev. Jay Huntington, of Greenville.
3. Address of Welcome—By Hon. Rufus F. Sprague, Mayor of the city.
4. Introductory Remarks; Statement of Purposes of the Convention, by Hon. John Avery, M. D., Member of the State Board of Health.
5. Address—Obstacles to Sanitary Reform, by Rev. J. L. Patton, of Greenville, President of the Convention.
6. A Paper—The Water-Supply of Greenville, Present and Prospective, by James Mulhern, M. D., Health Officer of Greenville.
7. Discussion of the subject.
8. A Paper—The Relation of the Newspaper Press to Sanitary Reform, by E. F. Grabill, Editor of the Greenville Independent.
9. Discussion of the subject.
10. A Paper—Muscular Hygiene, by D. A. McLean, M. D., Health Officer of Stanton.
11. Discussion of the subject.

Second Session.—Tuesday Evening, April 11, at 7:30.

1. Reading minutes of previous session.
2. A Paper—The Prevention and Restriction of Diphtheria and Scarlet Fever, by Arthur Hazlewood, M. D., of Grand Rapids, Member of the State Board of Health.
3. Discussion of the subject.
4. A Paper—How Can We Obtain and Preserve the Best Eyesight and Hearing? by Leartus Connor, A. M., M. D., of Detroit.
5. Discussion of the subject.
6. An Address—Pure Air; Why we should have it, and how we shall get it, by Rev. D. C. Jacokes, D. D., of Pontiac, Member of the State Board of Health.
7. Discussion—Five-minute speeches on the subject of Ventilation.
8. Appointment of committees.

Third Session.—Wednesday, April 12, at 9:30 A. M.

1. Reading of minutes of previous session.
2. Prayer—By Rev. A. A. Brown, of Greenville.
3. A Paper—Effect on Public Health of Overflowed Lands adjacent to Maple River, by S. E. Gillam, M. D., Health Officer of St. Johns.
4. Discussion—Five-minute speeches.
5. A Paper—Vaccination: Jenner *versus* Bergh, by Charles M. Martin, M. D., of Greenville.
6. Discussion of the subject.
7. A Paper—High Pressure *versus* Hygiene in our Public Schools, by Rev. M. W. Fairfield, of Muskegon.
8. Discussion—Five-minute speeches.
9. A Paper—Food Adulterations, by Prof. A. B. Prescott, M. D., F. C. S., of Ann Arbor.
10. General Discussion.

Fourth Session.—Wednesday, April 12, at 2:30 P. M.

1. Reading of minutes of previous session.
2. A Paper—Prenatal Exhaustion, by Frank K. Owen, M. D., of Ypsilanti.
3. Discussion of the subject.
4. A Paper—Sewerage of the City of Greenville, by O. G. Fox, of Greenville.
5. Discussion of the subject—Five-minute speeches.
6. A Paper—School Hygiene, by Prof. E. P. Church, of Greenville.
7. Discussion of the subject.
8. A Paper—Meat—by Prof. V. C. Vaughan, M. D , Ph. D., of Ann Arbor.
9. Discussion.

Fifth Session.—Wednesday Evening, April 12, at 7:30.

1. Reading of minutes of previous session.
2. Prayer—By Rev. E. W Flower, of Greenville.
3. Miscellaneous Business, Reports of Committees, Resolutions, etc.
4. A Paper—The Disposal of Decomposing Organic Matter, by J. H. Kellogg, M. D., of Battle Creek, Member of the State Board of Health.
5. Discussion of the subject.
6. A Paper—Relation of the Church to Sanitary Reform, by Lemuel Clute, Esq., of Ionia.
7. Discussion of the subject.
8. A Paper—The Enforcement of Sanitary Regulations, by Hon. H. H. Holt, of Muskegon.
9. General Discussion.
10. Closing of the Convention.

The following account of the Sanitary Convention at Greenville, is kindly supplied by Charles S. Sheldon, A. M., M. D., of Greenville, Secretary of the Convention.—HENRY B. BAKER, *Sec. State Board of Health.*

FIRST SESSION, TUESDAY AFTERNOON, APRIL 11, 1882.

The first session of the Sanitary Convention, conducted under the auspices of the State Board of Health, was held in the spacious and comfortable audience room of the Congregational church. The room was well filled with the citizens of Greenville and vicinity, the ladies especially showing their interest by attending in large numbers.

The following members of the State Board of Health were present: Dr. Henry B. Baker, Secretary; Rev. D. C. Jacokes, Pontiac; Dr. J. H. Kellogg, Battle Creek; Dr. Arthur Hazlewood, Grand Rapids; and Dr. John Avery, of Greenville.

Many distinguished gentlemen from abroad were also present during this and the succeeding sessions, including Gov. D. H. Jerome, ex-Lieut. Gov. H. H. Holt, Drs. Wm. Oldright and J. J. Cassidy, of Toronto, Ont., the former chairman, and the latter a member of the newly established Ontario Board of Health; the Rt. Rev. Geo. D. Gillespie, of Grand Rapids, Dr. Leartus Connor of Detroit, Rev. M. W. Fairfield of Muskegon, Prof. A. B. Prescott of Ann Arbor, Dr. Wellings of Lansing, Drs. McLean, Bachman, Corey, and Sullivan of Stanton, Drs. Corbin and Gillam of St. Johns, Dr. James Totten of Pierson, Lemuel Clute, Esq., of Ionia, Dr. Gamber, of McBrides, and many others.

At two o'clock the Convention was called to order by the Secretary, Dr. C. S. Sheldon, who introduced the President of the Convention, Rev. J. L. Patton of Greenville.

An appropriate invocation was pronounced by the Rev. Jay Huntington, after which the Hon. R. F. Sprague, Mayor of the city, delivered an address of welcome as follows:

ADDRESS OF WELCOME.

BY HON. RUFUS F. SPRAGUE, OF GREENVILLE.

Gentlemen of the Sanitary Convention:—To me has been assigned the pleasant task of extending, in the name of our people, to each and all a hearty and cordial welcome to our city.

Should a place upon the printed programme impart an air of formality to this simple duty, I am confident the individual acts of informal hospitality, which shall be extended to you during your short stay with us, will serve better than words to convince you of the sincerity of our greeting.

It is but recently that the question of sanitary reform has come to occupy its proper place in the estimation of even medical men, while to the non-professional mind it remains to this day "a mystery of mysteries."

In view of its high importance, the efforts of the State to popularize this subject, and render it more intelligible to the masses, is certainly highly commendable. Efforts in this direction, however, would avail nothing, but for the intelligent and hearty co-operation of the gentlemen of the medical profession throughout the State. And, if the best results are to be attained, the efforts of these gentlemen must in turn be ably seconded by the best intelligence of the communities in which these conventions are held. I trust the good people of our city will not forget this, but will by their presence, encourage these gentlemen to go forward in their good work.

In thus lending their aid to promote sanitary science, we must not expect our doctors will be so successful as to cause them any uneasiness lest they shall awake some fine morning, to find, like Othello, "their occupation gone," and themselves compelled to turn their attention in another direction, for a means of gaining a livelihood. We should look upon such a result, as a calamity to be averted at whatever cost, for we know too well the proverbial energy of these gentlemen, to concede to them even a half-hearted welcome, into the ranks of the sons of toil. Bone and sinew, like short-horned cattle, Spanish mackerel, and other marketable commodities, must be protected. And such a sudden reinforcement, from a quarter so wholly unexpected, might upset the balance of trade, and affect injuriously the present prosperity of the country. And what renders this question still more serious, we could not hope for congressional interference in our behalf. Our physician is armed with the ballot, Ah Sin of the Celestial empire was not. Congressional valor degenerates into cowardice in the presence of hostile votes.

But seriously, I for one do not anticipate so dire a calamity; and I doubt not, the physicians themselves know too well the infirmities of man's nature, to seriously apprehend such baneful results. They know full well, that man is something more than a "two-legged animal without feathers," as Plato once defined him. They know, for instance, that at best he is an arrant coward; that he is possessed withal of a vivid imagination; and that even the most robust will consult him occasionally, whether the difficulty be serious or otherwise. They know, further, that if the difficulty arise not from miasmatic influences, it will arise from indigestion, for there are still thousands "of an unbounded stomach." Remove the pestilential vapors which generate disease, and you increase the demand for mince pie, and inaugurate a bull movement in the cucumber market. Lobster salad, sardines, and kindred dishes will ever make the doctor a necessary—blessing.

I have given this subject considerable attention for the past week, and if I may judge from what I have learned—a very narrow foundation, I admit, ladies and gentlemen, upon which to base a colossal judgment—I should say it is simply a contrived plan, on the part of these medical gentlemen, to shift a very considerable part of their work upon our shoulders. A sort of labor-saving movement, looking toward undisturbed rest at night; toward more universal success in their wrestle with disease, with less hard work in mastering it.

They seem to desire to so arrange matters, that when they shall be called upon to attend a patient down with the old complaint—chills and fever—they shall have no occasion to fear measles, diphtheria, cerebro-spinal meningitis, Ayer's Cherry Pectoral, cholera infantum, Holman's Liver-pad, and other kindred diseases are lurking in ambush to steal in, the moment the physician's back is turned, and so complicate matters that he will be aroused at one o'clock in the morning, to learn that "Johnny is worse," or that "the last powder didn't seem to touch the right spot," and the "old man" is getting no better fast. This, as I understand the matter,—and you may readily see I am no novice at sailing in unknown seas,—is their chief object, and their ultimate aim.

Thus you will see my friends, there is really no good ground for the fear that we may be wholly deprived of the society of our doctors. Mankind ever has, and probably ever will, need his attention early in life, and so powerful is the law of association, few of us could contemplate with composure the idea of dying without his aid and assistance.

But I must close, lest I unwarrantably intrude upon a subject assigned to others. If I have accidentally contributed to your knowledge of sanitary science, please charge it to my ignorance. It was wholly unintentional, and I assure you I am more surprised than you can be.

But to return to my subject. When I first began to realize that an address of welcome would be expected of me I at once concluded to combine business with pleasure, and call the attention of the learned gentlemen of this convention to the various matters pertaining to this science, of which I was profoundly ignorant. I soon discovered, however, that whole volumes would not serve my purpose, and as at best "life's but a span," that scheme was abandoned. I then determined to confine myself strictly to sanitary measures, with which I was somewhat familiar, and boldly striking out, I soon found myself sailing upon an unknown, and to me bottomless, boundless sea, with neither chart, compass, or guiding star; with no familiar landmark, my only resource—wind.

One thing we may be assured of, however. The movement is in the right direction, and for the general good. We need no better assurance of this than the character of the medical gentlemen engaged in this work, and if that is not sufficient, I would call your attention to the hearty coöperation of the clergy. We have in this movement not only the M. D.'s but the D. D.'s, working hand in hand to promote a work which must be good or they would not engage in it with such zeal.

Wherever we hear of a Sanitary Convention, or for that matter any sanitary work, we hear of the clergy. Is this because cleanliness of person and surroundings begets cleanliness of soul, moral cleanliness? John Wesley indeed says, "cleanliness is next to Godliness." Be that as it may, we know the clergy are aiding in this work. And while I am not prepared to acknowledge that they are nearer infallible than the rest of us, I must admit my memory

does not serve to recall an instance, in the present day and generation, wherein they have given their united support to a movement wrong in tendency, or withheld it from one favorable to the general good.

Being thus doubly assured, why should we hesitate or hold back? I wish I might be able to convince our business men that this is a paying venture; that it would result in putting money into their purse. For after all, there is nothing in this world that so wins the heart to sympathy and love as cash dividends. As a matter of fact, I really believe it is a paying investment, but unfortunately I cannot recall a person who would be willing to take my word for it. And I say to those gentlemen who are to follow me, convince our people of this and you make sanitarians of them all.

And now, gentlemen of the convention, allow me to express the hope that you may have a pleasant, enjoyable time during your short stay with us. I trust you may find this meeting profitable, not only to yourselves, but to the science it is aimed to foster and encourage. I trust our people may acquire valuable information, and thus the objects of this convention be secured.

And, gentlemen, in conclusion let me say, You are as welcome to our city, to our places of business, and to our homes, as I am ignorant of Sanitary Science. Words of deeper significance are not written in books, or spoken by human tongue.

This address was followed by a statement of the purposes of the convention, by Hon. John Avery, M. D., of Greenville, and member of the State Board of Health, as follows:

OBJECTS OF THE CONVENTION.

BY JOHN AVERY, M. D., MEMBER OF THE STATE BOARD OF HEALTH.

It is not long since there was held in this city a Teachers' Institute, under the general direction of the Superintendent of Public Instruction, to which teachers and the public in this vicinity were invited. The object of that institute was to acquaint teachers with the best methods of imparting instruction to pupils under their care, and to awaken and keep alive among the people a general interest in all matters pertaining to education.

Only a short time since, a Farmers' Institute was held here, under the management of the State Board of Agriculture. To that institute, farmers and all persons interested in agriculture were invited to be present and take part in its discussions. The object of that institute was to gather up from those engaged in farming, their individual experience, and give it back to the people of the State in the well-digested reports of the Board of Agriculture, and in this way to bring within the reach of all a more general knowledge of the best methods of agriculture.

We are now just opening a Sanitary Convention, under the general management of the State Board of Health, and it holds the same relation to the general public, in regard to all matters pertaining to the prevention of disease and the preservation of health, that our educational institutes do to education, and our agricultural institutes do to agriculture. The State in its wisdom and liberality desires to give to the health of its citizens the same care and protection it does to their education, property, and rights. For this purpose it has enacted laws, established local boards of health, and a State Board of Health to which is confided the "general supervision of the interests of the health

and life of the citizens of this State." This legislation is recent, and indeed the whole subject of practical sanitation is of comparatively recent origin—it is new to legislators, new to physicians, and new to the people. So this Board, desirous of learning what it can from the people; gathering up their individual views, experiences and wants to guide it in its action in an honest endeavor to prevent and restrict disease, promote health, and to comply with the law creating it, in its intent as well as in its letter, this method of gathering the people together in conventions has been devised and is being carried out in different parts of the State.

It is not necessary to enlarge upon the importance of the work we are engaged in. Property is the product of labor; labor the product of muscle and brain force; muscle and brain force is the product of physical health. If we would acquire the first, we must protect the latter—we must be sanitarians in order to become economists.

It is believed that thousands of people in Michigan are living in daily violation of the most elementary rules of sanitary science, who would not do so if their attention could be once thoroughly aroused to the fearful risks to which they expose themselves and families—nay, more than this, it is known that hundreds of persons die annually in Michigan from causes that are entirely within their power to prevent. Now people, as a rule, do not willfully expose themselves to these dangers. Better information on these subjects would lead to better practices.

In the year 1881, in 150 cities in the United States representing a population of about eight millions and a half, there were reported to the National Board of Health over fourteen thousand deaths from two preventable diseases, scarlet fever and diphtheria. It is believed that the ratio of mortality from these diseases is not greater in cities and towns than in the more sparsely settled portions of the country; and if this be true, it would represent a total of over eighty-six thousand persons as having died in the United States during the past year from these two diseases. What a fearful record to contemplate—the slaughter of 86,000 innocents! Add to this, the list of those who have died from other preventable diseases, such as small-pox, measles, whooping-cough, typhoid fever, etc., 86,000 more, making a grand total of over one hundred and seventy-two thousand, and we have some idea of the importance and magnitude of the work in which we are engaged, and to consider which we are called together in this convention.

Nor does this procession of 172,000 pass from us unattended. We must add to it a large proportion of those who die from malarial fevers, typhoid fevers, diarrheal diseases, erysipelas, consumption, and other diseases to a large extent preventable; making an army of over a quarter of a million in the United States surrendered annually to the general commanding the forces of filth, bad air, and popular ignorance.

We may not hope to save the whole of this vast army, but we can do much. And it is a solemn duty we owe to ourselves, our families, and to the community in which we live, to acquaint ourselves with the dangers to life and health which surround us, and to do all in our power to remove or avoid them. This, then, is the purpose and object of this convention. The State Board desires to hear from the people—to learn of them; to be brought into closer relation with them, and to have their earnest co-operation in all efforts to limit and stamp out disease. And in order that there may be intelligent and harmonious action between the Board and the people, the people need to be in-

formed of the doings of the Board, it and what is possible for them to do to aid it.

During the past year we have had two outbreaks of small-pox in this county; and in each case the local boards of health, aided by the efforts of the people, have been able to limit the disease to those who were exposed before its true character was recognized.

The people know this disease to be contagious, and they keep away from it. They know, too, though they are sometimes negligent in this regard, that vaccination is a preventive, and when the alarm of an outbreak is sounded, the people are in earnest, and demand that the authorities shall be efficient in the discharge of their duties. While this is true in regard to small-pox, it unfortunately is not so in regard to many other diseases.

In many localities they do not so fully appreciate the true character of diphtheria and scarlet fever, and these diseases are sometimes allowed to spread through whole neighborhoods with little or no effort on the part of the people or authorities to check them.

Not long since, nor far from here, I was called to visit a family where three children were sick with diphtheria—one died while I was there. A neighbor, the father of a family of small children, called and insisted against all advice and warnings, upon going in and assisting in laying out the dead child. He took the germs of the disease home with him, and in less than three weeks, four of his children died with diphtheria. This man would not have knowingly and willfully exposed himself and family to the small-pox. But he did not know and would not believe that diphtheria was contagious. What a fearful price he paid for his education. Still later and nearer home, I was called to a family where one child lay dead with scarlet fever, and another sick with the same disease. A public funeral had been appointed at the house, and it was almost time for the friends to arrive. Timely warning, and the good sense of the family when they were informed of the dangerous character of the disease, saved the house from being filled with children, and the probable scattering of the disease throughout the neighborhood. This could not have occurred in any community in Michigan had a case of small-pox been in that house. The education of the people in regard to that disease has taught them better. As to scarlet fever they do not believe it to be contagious, or more probably they have never given the subject much thought. It is true, that at the present time, most reading people have a sort of general idea or belief that diphtheria and scarlet fever are contagious. But this belief does not take hold of them with sufficient energy to arouse them to a determined effort to compel the authorities to isolate, fence in, and stamp out a case, as it does in small-pox.

Now the people need just that sort of education in regard to these and other diseases that they have in regard to small-pox. Of course their education should go farther than this. They should know that certain conditions or surroundings, such as filth, dampness, foul air, etc., intensify, and favor the spread of all contagious diseases if they do not develop some of them. They need and should have the kind of education that will lead them to the same prompt obedience to all laws designed for the prevention of disease, that they give to those for the suppression of crime. And if this convention shall be the means of creating such a public sentiment, it will have accomplished the object for which it was organized—and to that end I bespeak from all present,

ladies and gentlemen, a hearty and active co-operation, that the interests of public health and public wealth may be advanced.

Rev. J. L. Patton, president of the convention, then delivered an address as follows:

OBSTACLES TO SANITARY REFORM.

BY REV. J. L. PATTON, OF GREENVILLE.

LADIES AND GENTLEMEN: The honor having been put upon me to preside over the deliberations of this convention, custom makes it my duty to come before you with a few words introductory, somewhat pretentiously styled in the programme an Address. Being a layman in matters pertinent, and having no topic appointed me by the committee, my field is naturally somewhat limited. To add to my embarrassment, I was forced by the programme-maker to name my subject before I fully knew what I wanted, or might be able to say. You must not be surprised, therefore if, instead of being limited in what I say by the printed text, I simply keep in mind, in a desultory sort of way, that this is a sanitary convention.

It was a custom among the ancient Greeks, not always wisely observed, if a man wrought signal benefit unto his kind, to make a demi-god of him, and worship him. Accordingly, Esculapius, who was fabled to have first taught men medicine and the use of the knife and bandage, was the god of the healing art. It was a rare conceit of their poetic mythology, however, that made Hygeia, his daughter, goddess of good health, and set her to teach her worshipers how to not become sick—a thing which could not reasonably be expected of her father.

But there was more than poetic myth in this fancy. These pre-historic legends show the logical order of, and sometimes account for, the conception and growth in the human mind of certain great race ideas. This one shows, as legibly as a written history, that when, in their efforts to take care of themselves and get on well upon the face of the earth, men became sick, their first thought and invention was of a healer, an idea and invention which then came among men to stay. This legend also shows that the better idea of the maintenance of health unbroken by fending off disease, was not much later in asserting itself and its benefit,—it sprung up in the family of the very first physician.

This "sober second thought" has been slow in taking its proper place with the first in the mind and practice of the race. The modest timidity of her sex, and filial respect, may have combined to help keep back the wisdom of Hygeia. But in the growth of light under the teaching of experience, the daughter is coming before the father, and unless the Darwinian law of the survival of the fittest in the struggle for life should meet here the proverbial exception that proves it, the goddess Hygeia will yet be on the supreme throne, with Esculapius, the god of medicine, in her train, where he ought always to have been.

This convention, at least, acknowledges her beneficent sway, and pays homage. We have no invidious discriminations to make against the worthy followers of the exalted son of Apollo, her father. Such conventions as this do look, indeed, to the reduction of their business; even their legitimate business may fall off somewhat in amount. But the great natural law of compensations will

hold good to them. If their patients should not be so many, those they do have will be more likely to get well under treatment and pay their bills. For this convention has been called in the interests of sanitary reform, which, in the order of nature, will tend mightily to lengthen the average term of human life in that it will secure better fiber and tone in the whole man organic, enabling him the better to resist and throw off disease when he does not thereby escape it altogether.

The discussions of the convention will have to do with questions that pertain to "a sound mind in a sound body." A reformer is, in the nature of the case, supposed to be a little ahead of the rest of the world, at least as regards the special matter in the which the world needs reformation at his hands. This is what entitles him to a hearing from men.

In his specialty he is both teacher and leader. He must go before, and do as he teaches, or nobody will pay much attention to his teaching. Hence our discussions here are to throw light upon ways and means for the best conditions of living well—in health and so far forth, in peace and comfort, and for the natural period of time. Comfort is a supreme consideration, and "that thy life may be long in the land which the Lord thy God giveth thee" is the "reason annexed" to one of the chief precepts of the decalogue. The business of sanitary reformers is to teach the people and show them the way, and they may magnify their office, for there will be no questions considered here that do not have to do in a vital way with the kingdom of heaven among men.

There is an authoritative injunction among men to be not over careful as to what they shall eat, what they shall drink, and wherewithal they shall be clothed. It is directed, however, perhaps, not so much toward the things necessary to these ends, but rather toward the question how we shall get them. And it is true, as it is written, man, if he lives best, and makes the most possible out of himself, "shall not live by bread alone." There are higher considerations that demand his attention.

But it is also true that the connection of the lower elements stand in such close and vital relations with the higher in our human organism, as that the lowest of them may not with impunity be treated with any neglect. Not only how a man shall get what he shall eat, but equally with this what he shall get, and how he shall eat it, lie at the foundation of successful physical life. With the human family laziness is a law of nature. It seems to us, at first thought, that if the order of nature could be reversed it would be better for us—at least we should like it better. If the human animal economy were like that of the polyp, or of the radiate, which dwells upon his point of stone, needs not to go abroad for his bread, and after digestion and use for the processes of life leaves no refuse that can poison or harm, simply turning it into limestone under its feet, then a man would have time to look up and improve his mind—take care of his higher nature.

But it is not so with him. If this be well, it is not so well with him as with the lower orders of vertebrates. Higher organization and rational powers bring with them great necessities. Our struggle for bread is not the half of it. The processes of life or of living, leave behind them destruction and death—human living leaves death-dealing death-poison to be taken care of—which the man must save himself from. So it comes that the most of a man's life must be occupied with his eating, his sleeping, and his keeping himself clean. Necessity is upon him,—for he will remain in the body almost as comfortably and just about as long, without the one as without the other. Here is the

main standing ground of the sanitary reformer—his "*pou sto*" from which he does his lifting.

Besides this, the battle of organic human life with accident and epidemic, with contagion and malaria, and the thousand forms, known and unknown, of poisonous ferments, which sap the foundations of physical life, is upon every man. The pestilence walketh in darkness and the destruction wasteth at noon-day. Not to dislodge these enemies after they have fastened themselves upon him, but to fend them off is man's best wisdom and strength. And this struggle is made more destructive and unsatisfactory from the fact that we do not know these foes, many of them, so as to be able to wage our war to the best advantage. Neither our rational faculty nor our physical senses give us warning of their approach, or even of their tactual presence. If there were a chemist and a microscope in every man's eyes and ears and nose, he would not then detect the presence of the typhus ferment, or that of the typhoid, while to men who see things and think, the suspicion must be growing that the whole world of experts is yet at fault as to what malaria is, what it comes from, and within what lines of latitude it makes its habitat. But in regard to all these things we know this: Experience has taught us, that if men know how to eat and sleep and keep clean, and will do as they know, they will have in themselves the best possible conditions for successful resistance to these foes of life.

But in this phase of the struggle mankind are, as yet, at fault. Under the best civilization thousands die yearly of preventable diseases. There are also thousands of preventable cases of disease—sicknesses that leave men weakened in their powers of life and endurance, and with doctor-bills,—which they ought to pay, not so much because the doctors cured them, which frequently is the case, but because they had no business to be sick.

To reform the public mind and habit as to these sanitary conditions of living long and well—the laws of good health—is the work of boards of health, sanitary officers, and such conventions as this—to make the people know the ordinary ways and means of taking care of themselves and preserving health, and, if possible, feel the necessity of conscientiously observing them.

For, so far as the people are concerned, there are two phases to this theory of sanitary reform, to each of which those who would help people to good purpose must give attention and wise effort.

Men are not only fearfully and wonderfully made, but they are fearfully and wonderfully ignorant as to how they are made—as to the parts of their physical machinery, the organic construction and functions of their own bodies. There is scarce any subject of human knowledge of which the mass of men know so little as of their own proper selves. It is hard to illustrate. Here is a man of mature years, who when asked the other day what the thorax is, said that it is a big vein that runs down the backbone. But that man is a practicing surgeon, had performed an autopsy on the body of a murdered woman, and made this answer on the witness stand of the circuit court. What, then, must be the condition of the great body of laymen? And ignonorance here involves ignorance of the necessary conditions of good health, and hence inability to furnish them. If a man were as ignorant of the structure of a locomotive as many of us are of our bodies, or even of a common road-wagon, he could not possibly take care of and use it so as to maintain its natural health and efficiency. Like most men, it would not live out half its days, and for like reasons. Any intelligent and thoughtful medical practitioner, who has seen the unreasonable expectations of sick people and their

friends, will better know just what I mean. The average sick man, or the average man who is not sick, has no idea that health and sickness are alike functional conditions. He thinks that disease is a thing, a something, an entity, and may be expelled much as a boy drives one wad out of his pop-gun with another, and if his doctor fails to do for him something that answers to this idea, he straightway discharges him and sends for another of whom he may hope better things. If the physician cannot at once expel the disease, he must at least be able to give the sick man a reasonable account of his case. I was in the habit, a few years ago, of calling often upon a sick man who had been justice of the peace, and superintendent of a Sunday school—an average man. He had discharged two good physicians because they told him he had organic disease of the heart, and they could not cure him. I met the new doctor at the patient's bedside, one day. To my question about the organic disease, he answered, "Yes, there was organized diseased action of the heart's power when I took the case," with complications, asthma, and dropsy. "But if nothing else sets in I'll have him on his feet in a little while, all right." This reasonable diagnosis and promise satisfied the man perfectly till death "set in" a little while after.

It is said, and there is good show of authority for it, that knowledge is power. George Eliot asks why nobody ever speaks of the power of ignorance. Ignorance is not properly power. It cannot tunnel a mountain—it is the mountain to be tunneled—lies in the way of every proper accomplishment by power. It is weakness to the mind, and weakness and death to the body. This ignorance of men in mass as to the anatomy of their own persons and of the physiology and hygiene pertaining thereto, means ignorance of the laws of health, and their consequent violation and penalty. Sanitary reform will make no headway worth mention through such ignorance. It is not enough that some physicians and a few experts and specialists be intelligent as to sanitary science. The people will not gather themselves up and do these things merely because they are told by a sanitary convention that this will be best for them. To the end that they may live long and to best purpose, the object to be attained, people must themselves become intelligent—how to build their homes and their cities, how to eat and how to sleep, how to work and how to rest, how to keep the earth clean where they are, and the air, and the water, also themselves, and everything about them. They must know how to keep up the wholesome balance between the activities of the physical man and those of the mind. They must also know how best to keep every part of their own animal economy at its own proper work, and fully up to the requirements upon it of the whole man. They must also see why these things are necessary. All this may be the work, properly of the common schools of the land, but it is the proper part of sanitarians to call for it. If our boys and girls at the age of sixteen years could chart the arterial and venous system of the human body and have sufficient knowledge of its functions and hygiene, they could well afford to be ignorant of the river systems of Europe, Asia, and Africa, and if they could also have knowledge of the nervous system, the system of digestion and nutrition, the respiratory system, and the mechanics of the bones, with their several functions and hygiene, they could afford, even as a means of mental discipline, to leave out the rest of their geography, their definitions of dictionary words, and part of their mathematics. This would give foundation for sanitary reform such as might, in time, bring human life up to its natural duration of a hundred years. For do the best man can, earthly life must end. Men will be sick, will die of their sickness. When Horace Mann, President of

Antioch College, was told by his physician that his sickness was unto death, it is said that his wife exclaimed, "Oh no, he cannot die, he has broken none of the laws of health." It would not be difficult to show that the order of things that makes this inevitable is wise. But men may and ought to live longer than they do, and they might be saved from the tender mercies of quack doctors and patent medicines while they do live. It would be a grand stroke in sanitary reform if we could secure at the hands of state and nation two things—that no letters patent shall ever be issued upon medical nostrums, and that every medical college that matriculates a student who has not had a certain definite and sufficient course of literary training and mental discipline, shall forfeit its charter. Under the older and better civilization of England the state does not permit a man to shoe a horse on his own responsibility until after he has spent seven years in learning how. But here, alas, a man that has not training enough to enable him to master the mechanism and physiology of a horse's foot may practice upon the human form divine. And this, while there is no calling among men which so entirely depends, or in which such interests are staked, upon strong powers of observation, careful deduction, and discriminating judgment, as in the common practice of medicine. It calls for the best men—men with well disciplined minds and an enthusiasm for humanity.

This is not wholly anent. But to return a little. It is not enough to remove the ignorance of the people. There is another phase to this matter of sanitary reform. It is a most stubborn fact connected with the behavior of the human family, that even when men know what is best, they do not all of them spontaneously do it. A present gratification is worth more to most men than a permanent future good. Indeed, the curse, the bane of earthly life is that a man will take chances against himself and even certainties, for sake of present gratification. He will take the strong chance of dying five or ten years before his time, with the certainty of making himself disagreeable to his dearest friends while he does live for sake of the nervous gratification he finds in the narcotic tobacco. The standard sixty thousand men of our land who yearly die premature deaths from the alcohol habit, all form that habit with their sanitary eyes open. Most people seem to be afraid of small-pox, but the whole families are legion that will take their chances of diphtheria and scarlet fever rather than obey that short sanitary law of two tables—"clean up, and clean out." Most people, before they will do as well as they know how and "be good to themselves" must be plied with incentives.

Here the question of sanitary reform strikes hands with the great questions of morals and religion. The eternal considerations which lead men to be conscientious and hold them to the faithful doing of that which ought clearly to be done, will here be in point. The true and full sanitary reformer is, in a double sense, a preacher of righteousness. And even then the sanitary millennium is not yet.

I may not anticipate or trench upon the questions that are to be carefully presented before this convention for discussion, and further suggestion is perhaps now idle. The field is broad. But I cannot forbear a single point further, to which sanitation must come, and concerning which it is now high time for general and rational inquiry. In distinction from those that have gone before it, the present geological age of the earth is called the dynasty of mind, and at no period since this rational dynasty was set up has mind, distinctively considered, been so thought of, cared for, and developed in power as in the present. But between the growth of the mind itself and the perfection of its vehicle, its instrument, the body, there is a fixed ratio. It

cannot be transcended. And it may now be a question whether the mind can rise much above where it now ranks without a better physical system in which to work and grow. There is a call in the mental dynasty to-day for deeper chests, squarer shoulders, harder bones, brawnier muscles, and, chief over all, a nervous system that can generate vital forces that shall animate these and keep them in the perfection of health and working order. This for sake of the mind, or its dynasty has reached its climax. For the nervous haste and strain and worry of civilization, the prevailing vicious habit of goading or burning out the brain and its tributaries by nervous stimulants, and, not to name others, the hot-bed forcing process of education through which we drive young children, forebode deterioration,—the burning up by its nervous fires of the whole man ere many generations. This is grave matter for sanitary consideration. For if there be not reform here, Macaulay's savage Cossack horsemen may vent his crude meditations over a forgotten civilization not alone from the pier of London bridge.

A single word practical. In religious science theological doctrines are profitable only when they are so presented as that men can see how they apply and can get hold of them for help to a better daily life among men before God. This principle holds in sanitary science. What people need most to know is not the theory of ozone, but how to build their houses for good ventilation. To know how to build a good, wholesome kitchen-drain and to be willing to take the pains to do it is worth more to a man than to be able to find the "physical basis of life." Except as a sort of training-school for a few, our convention will come short of its high end and privilege if in our papers and discussions we speak over people's heads. There is wholesome promise in the fact that our intelligent, trained, and successful physicians are becoming our leaders and teachers in sanitary reform. That will perhaps be the sanitary millenium when the family physician stands by and sees to it that his patron ventilates, builds good drains and sewers, and makes ready every way that himself and family may live healthily and long.

In behalf of the community I represent, I gladly recognize that this convention is for us, the people who need to hear and learn. To the members of the State Board of Health, and other gentlemen, strangers who have kindly responded to invitation, we extend most cordial welcome, and stand at attention to hear what you have to say to us.

The next paper was on the "Water Supply of Greenville," by Dr. James Mulhern. It is as follows:

THE WATER-SUPPLY OF GREENVILLE, PRESENT AND PROSPECTIVE.

BY JAMES MULHERN, M. D., HEALTH OFFICER OF GREENVILLE, MICHIGAN.

Mr. President, Ladies and Gentlemen:—As I understand the intent of our sanitary conventions that convene so frequently in the different cities of our State, it is not for the purpose of discussing hygienic questions in a manner requiring a full technical detailed account of scientific investigations, but to present to the people the results of these investigations in a form and manner acceptable to them, so that the masses of the people may practically receive the benefit of the indefatigable labors of the scientist and experimentalist. And it is, perhaps, largely owing to the fact that this idea is so gener-

ally adhered to at our conventions, that the method and result of the organized labor of the sanitary department of the State of Michigan, are so highly eulogized by prominent journals in other states of the Union.

The subject assigned me for presentation, that of "water," "the Water-Supply of Greenville," is one of vital importance to the people. Pure water and pure air, two of God's greatest blessings, the essential aids to the continance of animal and human life (for without either we can exist but a very brief space of time) are too generally undervalued, because they are so generously bestowed upon us by our Creator.

The free use of both, coming to us as they come from nature, uncontaminated by man's intervention, are calculated to produce a pure and perfect physical development,—but their free use as they are too often vitiated by man's ignorance, negligence, or selfishness, are too often calculated to produce a vitiated and diseased state of the physical system.

But the question might here be asked, what are the elements that may contaminate the water, engendering ill health and disease, and how may they enter into and compose some of its constituent parts?

Although other, such as the decomposition of vegetable substances, contribute considerably to this, I would mention chiefly, as being the most deleterious in their nature, decomposition of dead bodies, human and animal excreta, the drainage from which pollute our water and poison our systems.

The first we find principally in the burying-grounds, the next in the water-closet vaults, and the other in the barnyards and pig-pens.

From this it might be inferred that we have certainly one sure source of obtaining water-supply, free from any such contamination, namely, rain-water. This, as being distilled from the clouds, one would expect to be as free from impurities as it is possible to obtain water. As a matter of fact, however, this is not so. Rain, falling in the neighborhood of dwellings and cultivated lands, washes out from the air the impurities, the result of emanations from the earth, which exist there, and is often collected on roofs, which are in themselves more or less dirty.

It is estimated that half a pint of rain-water often condenses out of about 3,373 cubic feet of air, and thus, in drinking a tumblerful of such water, impurities which would only gain access to the lungs in eight days, are swallowed at once. From these facts it might seem to be vain to look to the atmosphere for a supply of water, pure enough for cooking and drinking purposes. But notwithstanding these facts, it is perhaps safe to assert that rain-water, caught upon a clean roof, in the surrounding vicinity of which the surface of the soil is free from deleterious encumbrances, received into a clean cistern, and securely protected from contamination by sewage, although an uninviting fluid, its use, failing better sources of supply, may be considered comparatively safe.

As a rule the purest water for use is that obtained from springs, the purity of which depends upon the amount of surface impurity, the more or less thorough percolation through porous strata, and the nature of the mineral substances through which it passes. But wells are generally the main sources of water depended upon for cooking and drinking purposes, and especially is this the case in Greenville.

But first, what are the conditions that may affect our wells in Greenville, more especially than elsewhere?

First, the nature of the soil. A gravelly or sandy soil is more favorable to free drainage and the conveyance of pernicious materials from or near the sur-

face to wells, than any other kind of soil, and this is the nature of the soil in the greater part of the city of Greenville.

Secondly, I would say that many of our wells, and those particularly, too, that are used by the greater number of persons, are in close proximity to barn-yards and water-closet vaults, the drainage from which may contain the poison, call it germ or what you will, each infinitesimal particle of which is capable of setting up some special form of disease, such as typhoid or scarlet fever—and it is an established fact that impure water from such sources gives rise to the large majority of cases of typhoid fever; and when we consider that it is computed that in Great Britain alone, 200,000 suffer annually from this disease, of which number 20,000 die,—it is hardly possible to overrate the importance to a community of a proper water-supply.

But when I condemn the quality of the water of Greenville, it might be consistently asked what remedy do I propose?

Some may rest in the supposed security of a cemented well. But this is not full security from drainage from deleterious substances, as the cemented walls are very apt to crack and give rise to leakage from the outside, and even if perfectly sound, the drainage is very apt to follow the course of the wall and receive access to the water from the bottom of the well.

The only source of a free supply of pure water for the inhabitants of Greenville that I can consistently recommend, as being free from impurities, and being sufficient in quantity to supply the entire wants of the city, would be from springs, situated east of the river, on property owned by E. B. Edwards. The expense of the procurement of the same is for your civil engineer to determine, not for me. But this would give us a free supply to the entire city, for cooking and drinking purposes, for lawn and garden use, and thorough sewerage of the city.

There is one point more, that has some bearing on this question, to which I desire to call the attention of the people, and that is this: It is a proven fact, that the rapid decomposition of sawdust when deposited in water, is very fruitful in the production of malarial fevers of all forms. This known to be a fact, it behooves the citizens of our city to insist upon a discontinuance of the depositing of sawdust and other refuse materials from adjacent mills into Flat river. These few prominent facts affecting the water-supply of Greenville I throw out with a view of inviting a discussion on the subject by gentlemen present who have had unlimited experience, and ample opportunity for thorough investigation of this subject.

DISCUSSION.

Dr. Kellogg, being called on, spoke of the importance of the subject, saying he had microscopically examined many samples of water, among which was one sample from a well which supplied an eating house at which several of the boarders had typhoid fever. On examination it was found swarming with animal life. It was not true that water must contain animalculæ. Nine out of twelve samples recently examined by him were found to be unfit for use. It was well to see that all was well with our wells.

Dr. Connor asked if the wells in Greenville were supplied with surface drainage or if they extended to bed rock, and spoke of water forming streamlets through the soil. In Brooklyn cesspools and vaults were used extensively. When the ground was full of water the vaults and wells were permeated alike, and the intervening soil was also permeated. The water sinks and in dry weather the volatile portion rose through the soil and that was the time of year when infants and children die by thousands.

Dr. Mulhern.—We have generally surface drainage, the soil being gravelly and porous, and thus favoring it.

Dr. Jacokes.—Some say well, if the water *is* bad it does not do so much harm; but however we may regard it we cannot prevent the result of our ill-doing. If you have no typhoid fever, you yet shorten your lives. You can't live so many years with impure as you can with pure water, and

have we the right to shorten our lives by drinking impure water any more than by taking arsenic? We have wonderful recuperative powers, but they become worn out after a while. There should be no animals or vegetables in pure water, and they do not eat each other up as some people think, but what we see is the filth in the water. You want to look to that matter and cut off the source of supply.

Dr. Martin.—We often ascribe to malaria what is in reality due to other causes. Although malaria is, of course, responsible for much of the disease in this locality, we shall find, if we look closely, that impure water is also a fruitful source. He instanced several cases of recurring diarrhea, typhoid fever, etc., due to dirty wells, cess-pools, and impure water.

Dr. Hazlewood hoped that people would not be afraid to drink water in any shape, for after all other causes of infection are removed we can still boil it.

THE PRESIDENT remarked that there were some things drank in the town that are even worse than the water we drink.

This paper was followed by one by E. F. Grabill, editor of the Greenville Independent, on the "Relation of the Newspaper Press to Sanitary Reform." It is as follows:

THE RELATION OF THE NEWSPAPER PRESS TO SANITARY REFORM.

BY E. F. GRABILL, OF GREENVILLE.

The newspaper has the same relation to sanitary reform that it has to any other. As a teacher, it enlightens the public as to its wants, warns it against dangers, counsels it to learn knowledge of its true condition, and advises it to gain the wisdom which results from keen observation of its environments and the lessons that even the dullest should learn from bitter experience.

Possibly the press, in its relation to sanitary reform, appears oftener as a counselor and adviser. As sanitary reform deals largely with the preservation of health and the prevention of disease, it is the province of the newspaper to first warn the public of possible evils that may at any time become real. It is not enough that, after typhoid fever, scarlet fever, small-pox, diphtheria, or any like scourge has invaded a community, it seeks its removal or attempts to lessen its horrors; but in time of seeming security from harm it points out the danger of a possible invasion of an epidemic, and seeks to destroy the immediate and remote causes of such visitation. Does typhus and typhoid fever result from ill ventilation or bad sewerage? Then the public is advised to secure good ventilation and sewerage that does not distill death in our dwellings. Is small-pox less fatal in case of inoculation of kine pox? Everybody is advised to be vaccinated. Are diphtheria and scarlet fever contagious? Then let the most effective means possible be used to seclude the infected patients and remove and destroy all disease germs before the convalescent is permitted to pass quarantine. And so with all possible dangers which prudence and foresight may totally prevent or greatly eliminate of destructiveness. This is the chief field of journalism in relation to sanitary reform.

How the press may be the most influential and useful in this field is a question on which much may be said. Negatively, we may affirm that the newspaper will not best secure public attention to sanitary reform by publishing long essays on any topic. Long essays will not be read by the people at large; even if they are read, if they are couched in the usual scientific phraseology, they will not be understood. People as a rule will not read essays the wording of which is not understood without reference to a dictionary or cyclopedia. And the people have not, or will not take, time to read long articles. Long and ponderous editorials are a thing of the past, as you can see by reference to any well-edited newspaper. This is the day of pungent paragraphs.

The newspaper, as a rule, has no place for theorizing as to possible diseases. It wants most, in its efforts to affect public sentiment, the original facts touching sanitary questions as the facts develop. Given the facts, the people will make for themselves deductions sufficiently correct for practical use. A newspaper may preach long sermons on the enjoyment or utility of health to no avail; but if it can impress upon the public the fact that surface water finds its way into and makes foul and unhealthful every unprotected well, practical good is secured.

The press should furnish the facts while they are news, if it may be, while the public has an appetite to appropriate them and interest to digest them. Dr. Avery made a report to the State Board of Health on the relation of disease to certain overflowed lands in Gratiot county. The Ithaca Journal published the report at once while public interest was directed to that subject. At some other time more remote the article published would have secured but little attention.

If the facts cannot be clothed in the garb of news, they will secure more of interest and greater circulation if they can be invested with personal interest by connecting them somehow with somebody. People are always interested about people, and in reading about people associated with certain sanitary facts, unconsciously they will absorb some sanitary knowledge. If it could be shown that in the case of a particular individual, diphtheria was caused by the polluted air surrounding a house in whose yard the hogs root and the ducks paddle, and the dishwater stands in stagnant pools, the lesson would make a lasting impression for good.

In fine, to aid sanitary reform the press must, in all ways, by all means, give the public the strong impression that it advocates sanitary reform because of personal interest to secure to people their highest physical good.

DISCUSSION.

An expression used in the paper led to an interesting discussion of the subject of the protection of wells from contamination.

Mr. Ellsworth asked if there was in the city a well absolutely protected.

Dr. Jacokes said that much might be done by keeping the surface of the ground about the well absolutely clean and free from all kinds of slops.

In reply to a remark made by Mr. Jas. Satterlee that he believed that this soil was well adapted for wells on account of its gravelly nature, Dr. Jacokes replied that water going through the ground and the earth does not change its chemical nature, but only takes out the coarser particles of organic matter.

Dr. Oldright, of Toronto, said he would like to confirm the statement by Dr. Jacokes. If the water be impregnated with filth it will still have it after passing through the earth. In Toronto the municipal authorities have tried the experiment of passing the lake water which supplies the city through a bed of sand for the purpose of purifying it. They reasoned that the earth would remove its impurities. The experiment is a failure. The water is now more impure than it was before, and the city has abandoned the method. It now takes its water-supply directly from the lake, at the depth of at least thirty feet and at such a distance from the shore that it will not be affected by drainage or storms. The same is true of filters. The water passing through them will take up even more organic matter if they are not frequently renewed.

Dr. Kellogg supposed at one time that the soil was a good filter, but it does not remove the germs which give rise to disease, and the same is true of filters. He made it a point never to drink water out of a filter till he knew how the filter was constructed and managed. They need to rest every third day and thus get a fresh supply of oxygen. So there should be two filters and there should be no lead about them. The best filter is probably an earthenware jar filled with powdered charcoal. A large flower pot will do very well.

Dr. McLean, of Stanton, said that we should aim to arrive at practical results, and suggested that health officers test, by actual experiment, the water from the wells in their localities and find out what water is contaminated.

Dr. O. S. Sheldon asked, how near to cess-pools is it safe to dig wells?

Dr. Jacokes replied that a well twenty feet deep will drain a territory of about two hundred

yards—some a larger surface—it depends on the character of the soil.* By all means do away with the horrible vaults and slop receptacles which are such breeders of disease. Better carry dish-water clear out of town than suffer wells to be contaminated by it. He recommended dry earth for closets.

The next paper was on "Muscular Hygiene," by Donald A. McLean, M. D., Health officer of Stanton. It is as follows:—

MUSCULAR HYGIENE.

BY DONALD A. McLEAN, M. D., HEALTH OFFICER OF STANTON, MICH.

It is a popular saying that "the world grows weaker and wiser," which, like many other popular sayings, is mainly erroneous. It may, however, contain a "soul of truth" worthy our attention. That the saying is erroneous in its commonly accepted meaning we have ample evidence in the greatly increased average duration of human life, which exceeds that of any previous period in the world's history. It is full of promise to know that the stay man is permitted to make on this earth has direct relation to the industry with which he labors to discover, and the faithfulness with which he obeys, the varied and complex conditions of his existence.

But when examined closely, the increased length of life will be found to be due largely to modifications of surrounding circumstances, as in the prevention of epidemics, or lessening their fatality when they do occur, providing more and better food, better dwellings, better care for the sick, and all the improvements which advancing science and civilization furnish. In other words, the efforts of sanitation have been mainly directed to man's environment rather than to man himself; and we find as a consequence as the helps and conveniences of modern life are more and more brought into use, and his physical powers less required to accomplish the work of his life, those powers deteriorate, and in this sense the individual grows weaker as he grows wiser; and it may be an open question whether this deterioration will not become in a few generations sufficiently great to counterbalance the benefits of improved surroundings, and the duration of human life again grow shorter from failure of vital power. I speak now of the more advanced civilization and of our own country in particular. With us, who live fast and work under high pressure, making use of every means known, and constantly inventing new ones of annihilating time and distance, the development of a physical system by careful training to a condition of healthful vigor sufficient to stand the wear and tear of a laborious mental or business life is rarely taken into consideration; more rarely, actually undertaken. As the result we find that we are fast becoming a nation whose mental development, which is constantly receiving attention, is in excess of the physical which receives little or none, that we are becoming a people whose nervous systems are out of proportion to the muscular, and that nervous derangements and diseases are becoming fearfully prevalent as a consequence.

From the day the child enters the school to the last day of the school life, and with many through all the years of active life, the attention is steadily directed to the education of the mind, with little or no thought to the education of the body, thinking apparently that that is a matter which will take care of itself; and the idea that any special preparation of the physical system

* [It is sometimes said that a well is liable to drain a cone of earth the diameter of the base of which, at the surface of the earth, is three times the depth of the well.—H. B. B., Sec. S. B. of H.]

is requisite in order that the mental training may accomplish that for which it was designed, seems never to have occurred to them. I speak now in general terms, for I am well aware there are many people who recognize the importance of the subject, and a few schools and colleges in our land where systematic physical training is as much a part of the curriculum and as faithfully taught as are Latin, Greek, or mathematics. But I submit that in this land of almost unlimited educational advantages, with a school system second perhaps to none in the world, that the claims of the material portion of our being do not receive the attention they demand.

The consequences of this unequal education are far-reaching and disastrous. They make their appearance at the very threshold of school life and their progress is traced by the big heads, narrow shoulders, pale faces and flaccid muscles of the graduates, and the early graves of the earnest workers and successful ones in after life.

I do not wish to be misunderstood as proclaiming that defective physical training is the cause of all the ills of school life, but only an important one of a number, and the one that appears to receive the least attention. At the recent Sanitary Convention held at Ann Arbor, the subject of school hygiene, with reference to the injury to health and frequent breaking down of the pupils under school discipline, the cause and remedy was long and ably discussed. Various and conflicting opinions were expressed as to the share chargeable to mental overwork, and to the necessity of lessening the tasks of the pupil, but scarcely a word of the part to be charged to physical underwork, and the feasibility of fitting the pupil to bear the strain and accomplish the work without injury. And yet I venture the assertion that were the same amount of care exercised in training and developing the body as is shown with the mind, such a thing as injury arising from efforts to accomplish the ordinary tasks of school would be unknown. I fully recognize the fact that all children are not alike in their capacities for learning or of bearing mental strain; but it is not the dull and stupid that are injured by the mental labor of school as a rule, but the nervous, sensitive, and precocious ones, and these would labor at their tasks with vigor and animation, and with the sense of growing power which healthful exercise imparts. I seriously doubt whether the mental labor required of a student of our graded schools is ever of so severe a character as to be in the slightest degree injurious were it carried on under proper sanitary conditions and with a physical system in the working order that may be so easily acquired and retained. Under the present system I have no doubt many break down and are permanently injured, if they do not perish in their efforts to accomplish the work; but I charge the result to the violation of sanitary laws, and prominent among them the lack of adequate muscular exercise.

But is there really the necessity for physical culture among school children and students that I have indicated? Do they not run and leap and take all the muscular exercise necessary in the intervals between school hours? One careful glance at the pupils of our schools as they pass in review before us will answer the question with unfailing certainty. The hollow chests, drooping shoulders, thin arms, and shuffling, listless gait of the majority of them, will give the impression that much may yet be done to improve their physical health and strength and add to the prospect of future life and usefulness. I do not mean to say that muscular training will remove all the defects we perceive here. I recognize too well the laws of heredity to expect any such result. Mr. Beecher is accredited with no more profound saying than the

solecism, that "the first requisite to secure health and long life is to be particular in the selection of one's parents." Large numbers of children inherit unsound bodies. The particular contour, the size, gait, and general physical appearance of the parent appears in the child as constantly as do the mental traits of character, and it is as much the province of a correct educational system to endeavor to elevate the standard of the one as the other.

With us in this State who are yet a comparatively rural population, and not subjected to the terribly deteriorating conditions of the inhabitants of the cities of the old world, the vital powers of our children do not yet exhibit marked failure. But it is undoubtedly true that the cities of our New England States are rapidly approaching that condition, and it behooves us to study well the causes, and the means for its prevention. Dr. Fothergill, in discussing this subject of deterioration in the cities of Europe, says, "With the practical turn of his race, the town inhabitant protects himself and his young, so far as lies in his power, brings his water from long distances, constructs elaborate sewerage arrangements, thus copying the wisdom of the old heathen at last; further, he has appointed medical officers of health, and analysts, still more to guard him and his. He has learned that poison germs may lurk in his water and still more in his milk supply; he has provided, so far as in his power lies, against these fluid-borne diseases, yet the tale of the dead so slain is but as a unit against myriads. For one victim to zymotic disease a holocaust perish from failure in their digestive processes; for one infant lying in its last sleep from specific germ-carried pyrexia, a thousand wasted marasmatic atomies are to be found in their graves from improper food and an imperfect digestion.

"The State now takes care that the children shall have at least the rudiments of an education; it protects them from small-pox by compulsory vaccination, one of the most beneficial of all discoveries. It guards their dietary by the Food Adulteration Act. Their milk is brought in tins from the mountain pastures of Switzerland in unlimited quantities, about the purity of which no doubt can reasonably be entertained. The fat-containing maize is brought to us in numerous forms. There is no difficulty in providing milk and a farinaceous dietary for our town infants. Much can be done for them, but more must be done still; artificial digestive agents may be given with suitable food to aid in and perfect the natural digestion, but something more is desirable.

"Plenty of exercise in the open air would secure an appetite for simple food as well as the perfect oxidation of all waste matter, and the child placed under such favorable circumstances, would be free from deterioration."

With us who do not need to send our children away into the rural districts to secure wholesome food or pure air, the plenty of exercise spoken of must be looked to largely to promote digestion and assimilation, prevent deterioration, and remedy inherited defects.

What we actually do for our children is to devote the school life to the training of the mind by steady, carefully graduated, persistent exercise of it, and then if we supply the school-room with good light, pure air, and warmth, and provide a play-ground, we think we have amply provided for the physical well-being of the scholars. As well might we expect, by surrounding a pupil with books and paper and slate and pencils, without his ever being required to spend his time in laborious use of them, to produce a finished scholar, as to suppose that surrounding him with the necessities of health and strength alone will make of him a strong, healthy, well-developed man. The steady, careful, systematic exercise of the one system is as imperative as the other.

It is true that the exercise the pupil takes during play hours is excellent so far as it goes, and, with some, the strong robust ones, it goes far towards compensating for the lack of systematic training in promoting health; but its faults are, that it does lack system, is irregular, apt to be excessive at times, and fails to develop some portions of the muscular system; but its greatest fault is that those who need it the most are just those who do not engage in it—sometimes from timidity, a fear of injury in the rough plays, but usually from an indisposition to exertion, a lack of that buoyancy and tonicity of the muscular system which makes such exercise a pleasure and which only comes from constant use, and this is especially the case with the girls. The disadvantages of dress, the dread of being considered rude and boisterous, and, with with the older ones, the potent demands of fashion and etiquette effectually bar their taking part in the active sports of their brothers.

In talking upon this subject recently with a teacher, I was told that without strong urging, or almost positive commands, the larger girls would rarely leave the school-room at recess, but would form themselves into groups about the room for conversation, thus failing to avail themselves of the little exercise and fresh air to be had at those intervals; and thus these school girls spend year after year of their student life, urging to the utmost capacity their active brains and totally neglecting their muscles.

The little walk to and from school, and that at a moderate pace, or, if in a city where street cars are available, not even that, constitutes the sum total of the exercise pertaining to her school life.

Is it any wonder that girls under such conditions "break down" before commencement day comes, especially under the strain of competitive examinations? Is it any wonder that girls obliged to climb two or three flights of stairs to reach recitation-rooms fall victims to ailments that embitter their whole lives, if they do not prematurely close them?

While I join heartily in the condemnation of school-buildings containing these flights of stairs, I feel constrained to say of them, as I said of the overtasked brains, if the muscular system were strengthened, as it might easily be by suitable training, rarely if ever would injury result from any necessary climbing of stairs. What think you would the woman trained for a professional walker, or the athlete who swings upon the trapeze or jumps the rope on the back of a running horse, or wagers to ride a bicycle 600 miles in six days, care for two or three or a dozen flights of stairs? But our girls, you say, are not athletes, neither do we wish them to be. True; but what these do shows what the muscular system of woman is capable of, and it can readily be be seen that a judicious amount of training would carry our school girls sufficiently far upon the road to strength and endurance as to place them beyond all danger of any injury arising from climbing stairs at school; and is not this question of the utmost importance? Go ask your family physician or, better yet, the skilled gynæcologist of extensive experience, and he will tell you that in a vast number of those cases he is called upon so constantly to treat the foundation is laid during school life, and that to climbing stairs, with the muscles of the body which should support and protect the abdominal and pelvic organs, weak and undeveloped, in connection with the suicidal custom of compressing the waist, the disastrous results can generally be traced.

I have often pondered over the economy of placing the children in rooms on the ground floor and sending the older ones to the upper rooms, thus throwing the straining of climbing stairs upon the girls at an age when they can least

bear it. I can only account for it on the supposition that an impression prevails among teachers and school officers that as the mind improves and expands the body should likewise be elevated. It seems to me that it would be much better if the system were reversed and the small children were sent to the upper rooms and those verging upon womanhood were kept below. The little girl can climb the stairs with much less danger of any harm resulting than can the girl after puberty, for several reasons. The physical condition of the small girl is nearly on a level with that of the boy, who never suffers from such causes; that portion of the system which is liable to receive injury in the older girl being undeveloped, there is not that danger to apprehend.

Again, the muscular systems of the girls of ten years are usually stronger and in better training in proportion to age, than of those of fourteen or fifteen, because the repressions of fashion and etiquette have not become so great, and especially because they have not yet begun to deform themselves by compressing and crowding out of place the vital organs of the body, and interfering with the action of some of the most important muscles. Among the numerous demands of fashion inimical to the health of its votaries none prove more disastrous than this. Instead of the muscles about the waist and pelvis being developed and strengthened by healthful exercise, they are not even allowed to use what little strength they may originally have had. What would be the effect upon the strength and usefulness of the arm if a bandage were applied to it, not tight, for no girl ever has any clothing about the waist tight, but just sufficient for "support," I think is the term, that is just sufficient to prevent the free play of the muscles and the perfect flow of blood through the vessels? You all recognize the fact at once that the usefulness of the limb would be destroyed. The evils resulting from interference with muscular action and compression about the waist radiate in all directions. The chest is not permitted to expand, the diaphragm cannot descend readily, the abdominal and pelvic organs are forced downward, the return flow of blood is retarded, and the entire economy of the system deranged. And the consequences do not stop with the individual. There is a saying that "if strong be the frame of the mother, her sons will make laws for the people;" and we might with truth add the converse that, if feeble and broken be the health of the mother, her sons and daughters shall fill early graves, or at best inherit constitutions scarcely fitting them to fight well and successfully the battle of life, or to transmit to their posterity that vigor and stamina essential for the safety and well-being of the individual, or the perpetuity of the race.

If we leave now the school-room and follow the students through their after-life, what shall we find as the result of the one-sided development they have undergone? Of those who choose active occupations consisting of manual labor nothing need be said here, as they suffer much less than some others from lack of physical training; but it could easily be shown that with very few of them is their labor such as to bring them symmetrical, well-proportioned, shapely bodies, and strength and endurance sufficient to carry them safely through an extra strain of mind or body, or the crisis of a dangerous disease, should one occur. But with the numbers who pass their lives in pursuits more or less sedentary in character, and especially those whose work is principally brain-work, the result is more marked. Unless such employ means to strengthen and improve the physical man, failure to acquire any marked success is almost certain. Upon this subject hear one who speaks from an abundant observation. The president of one of our best known colleges, in

one of his annual reports, in speaking of the value of scholarships to poor young men, says:—

"If sound health were one of the requisitions for the enjoyment of scholarships, parents who expected to need aid in educating their boys would have their attention directed in an effective way to the wise regimen of health; while young men who had their own education to get, would see that it was only prudent for them to secure a wholesome diet, plenty of fresh air, and regular exercise. A singular notion prevails, especially in the country, that it is the feeble, sickly children who should be sent to school and college, since they are apparently unfit for hard work. The fact that in the history of literature, a few cases can be pointed out in which genius was lodged in a weak or diseased body, is sometimes adduced in support of the strange proposition that physical vigor is not necessary for professional men. But all experience contradicts these notions. To attain success and length of service in any of the learned professions, including that of teaching, a vigorous body is well-nigh essential. A busy lawyer, editor, minister, physician, or teacher has need of greater physical endurance than a farmer, trader, manufacturer, or mechanic. All professional biography teaches that to win lasting distinction in sedentary indoor occupations, which task the brain and the nervous system, extraordinary toughness of body must accompany extraordinary mental powers."

If this be true, what prospect of distinction has the young professional man who engages in the contest with a large, well-developed brain, but with flattened chest, stooping shoulders, thin limbs, and flabby muscles? Very little indeed; he will simply struggle for a little while, to be pushed aside by some competitor of sturdier make, to either perish from mental strain in the effort to obtain a position, or sink to a condition of mediocrity and obscurity. And in those cases where on account of extraordinary genius, success comes, despite physical weakness, who shall measure the loss to the world in their labors both in matter and manner. Who knows how much of the venom of Pope, or the satyre and cynicism of Carlyle or Swift, or the healthy tone and lofty sentiments of Scott, Bryant, Longfellow, or Dr. Holmes, are dependent upon corresponding good or ill physical conditions?

I recently heard a man of more than ordinary ability say, in a public speech, that he thought mental work must be healthy work, as the majority of our great statesmen were large, healthy men, thus curiously mistaking cause for effect, it being due to the fact that they were large, healthy men with great powers of endurance that they became great statesmen,—for it is a long since established fact, that other things being equal, the staying capacity, or ability for continuous work is directly dependent upon size. Who doubts that the great work accomplished and the lasting names enshrined of such men as Lord Brougham, Daniel O'Connell, and Gladstone, in England; Victor Hugo and Thiers, in France; Bismark in Germany; or Daniel Webster, Abraham Lincoln, James A. Garfield, and a host of others in our own country, were made possible by the magnificent physiques and powerful frames of those men.

I was recently called to see a prominent lawyer of an adjoining city who was taken with dizziness and faintness whilst in attendance upon circuit court. His history showed him to be constantly overworked mentally and underworked physically. Spending hour after hour in the vitiated atmosphere of the court-room, then at his office until midnight or later, taking practically no exercise and no rest, dyspepsia with all its train of evils, headache, flatulence, palpitation of the heart, dizziness, faintness, etc., as the legitimate result of such unsanitary conditions, could not fail to be present, and the man expressed himself as rapidly breaking down. For a man in the prime and vigor of manhood, who should have a score of years of good hard work yet before him, and then be in better condition than he is now, to confess that he is breaking down, and yet apparently having no decided intention of changing his habits of life, should attract the attention of the thoughtful conservator of public

health. It argues either that the claims of his profession and the greed for wealth and fame are considered paramount to life and health, or that he is ignorant of how much can be done towards fitting him for the load he is obliged to carry. And how many hundreds and thousands of professional men suffer more or less in a similar manner; and as a result, scores and hundreds of our best mental workers fill premature graves, victims not of mental overwork alone, but of mental work done without regard to sanitary laws.

But probably no one will be found to dispute that a thoroughly well-developed, strong, robust body is of great advantage in any department of life, and it only remains for us to consider the means of securing for ourselves and the coming generations that advantage. As I have already intimated, such a body can be secured where not already broken by disease, by careful, steadily continued, systematic training of the muscular system, and the observance of other proper sanitary conditions. The plan has nothing of newness or novelty about it. It is as old at least as ancient Greek civilization; and the Spartans, under the operations of the famous laws of Lycurgus, became one of the most remarkable people of history; and the models of beauty, symmetry, and strength of the human form, taken from that age, are yet the admiration of the world.

"The muscles, perhaps more than any other organs of the body, depend for their health upon regular, systematic, adequate, and proper exercise," says one of the members of our own State Board of Health, and I might add that upon the health of the muscular system depends to a large extent the health, activity, and usefulness of every other organ of the body. As our public schools are the places designed for the fitting and training of the minds of our children for their after lives, so they should also be for promoting symmetrical growth and development of their bodies, and compulsory education of the one should attract the solicitous interference of the State as much as the other. Prof. Huxley says:—

> "That man has a liberal education who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that as a mechanism it is capable of, the parts of whose intellect are of equal strength, in smooth working order to forge the anchors as well as spin the gossamers of the mind; whose mind is stored with the great fundamental truths of nature and of the laws of her operations; one whose passions are the trained servants of a vigorous will and a tender conscience; who has learned to love beauty, hate vileness, and respect others as himself."

If this be the standard of a liberal education I fear very many of those considered liberally educated, and graduated from our colleges as such, will be obliged to take a supplementary course or acknowledge themselves as deficient in one or more of the points named, and in none of them more often perhaps than the first particular, the perfect working of the bodily mechanism.

Were a rational system of physical education made compulsory in the schools of our State a single generation would present such a remarkable change in the health and physique of her citizens as to be unaccountable to one not acquainted with the cause, and I am not sure but that some of the members of our own profession might be in danger of finding their "occupation gone." Whilst this might be somewhat detrimental to the interest of the individual, it would certainly be productive of the "greatest good to the greatest number," which I believe is in accordance with modern philosophy.

In discussing the subject of school hygiene we frequently hear it urged, especially by medical men, that more physiology should be taught. To this I say, by all means let us have more physiology taught, but let us by all means have

a great deal more physiology acted in our public schools. Ten minutes good, brisk exercise of the muscles of the arms, legs, chest, and back, going through a series of motions, guided by the teacher, in the open air or with the windows of the room thrown wide open and the lungs well filled, will do more for the health of the pupils than as many hours spent in the study of the science. Let us remember that it is by actual use of the means prescribed that the benefit is derived and not by familiarizing ourselves with the laws and neglecting their observance.

Let the exercise be repeated at least twice a day, in the forenoon and in the afternoon, being very careful not to overdo the work at first, regulating it by the ability of the weakest pupil to bear, and gradually increasing the amount. A very brief time will suffice to show the beneficial results; the drooping shoulders will begin to be held back to place, the flattened chest to expand, dull eyes become bright, and the entire manner of the pupil changed. No school-building in a town or city especially should ever be built without a gymnasium attached, and pupils should be as thoroughly drilled and rigidly examined in that department as any other of the school. Teachers should be required to exhibit equal proficiency in the teaching of this department as any other. They are aware that musular health can only be obtained and retained by adequate use, and they are expected to be able to answer the questions in physiology in reference to that subject. Why should they not be required to prepare themselves to make practical application of those laws and guide their pupils as certainly towards bodily vigor and endurance as towards mental strength or moral grandeur?

In the absence of the school gymnasium we must do what we can to improve the condition of the scholars, and much may be done by the hearty coöperation of all interested,—teachers, pupils, school officers and parents. And this question has an aspect for the moralist as well as the sanitarian. The old debasing idea of the vileness of the body, that it was a part of man to be looked upon with contempt and treated with severity, has well nigh passed away with other relics of the dark ages, and it is beginning to be understood that unsound bodies, unsound minds, and unsound morals are very closely linked together.

I do not propose to enter here into a discussion of particular modes and methods of muscular training for the young, but shall indicate a few of the results to be obtained by those who have passed beyond the period of school life and are absorbed in the cares of a busy professional or business life. And in doing so I shall quote somewhat freely, as I have already done, from a little book which I would I could place in the hands of every teacher, yes, of every man, woman, and child old enough to comprehend it, in the land, and with which I doubt not some of you are familiar: "How to get Strong," by Wm. Blaikie, a book thought worthy to be placed in the Chautauqua Literary and Scientific course, and one well entitled to a place in that admirable scheme. What and how much muscular exercise then should men and women, who have completed their growth and whose forms have acquired their set and shape, be asked to engage in, and what good results can be expected? As to what can be accomplished in the development of the muscular system by determined effort after adult life has been reached is sufficiently answered by the knowledge of what the athlete accomplishes. From a condition of ordinary strength and endurance, he is brought by training to perform feats truly remarkable and that before were utterly impossible. His size, weight, and general contour have all changed, and if his training has been judicious and not carried too far, no harm has ordinarily been done. But it is not the train-

ing of the athlete that we desire; too often it is excessive and does harm, and tends to shorten life rather than prolong it. What we do want is sufficient use of the muscular system, by those pursuing sedentary occupations, to bring them up to a normal physiological condition and keep them so. In the language of Mr. Blaikie, "The aim is not to lay on muscle, not to become equal to this or that athletic feat, but simply to so exercise as to keep the entire physical and mental machinery in good working order, and himself equal to all demands likely to be made on him."

I can perhaps indicate nearer what this should be by calling attention to what others have done, who have attained old age with health and strength in a good state of preservation. Soon after the death of Wm. Cullen Bryant the following letter written to a friend some years previously appeared in the New York Evening Post:

New York, March 30, 1871.

"*To Joseph H. Richards, Esq.*

My Dear Sir:—I promised some time since to give you some account of my habits of life, so far at least, as regards diet, exercise, and occupations. I am not sure that it will be of any use to you, although the system which I have for many years observed seems to answer my purpose very well. I have reached a pretty advanced period of life, without the usual infirmities of old age, and with my strength, activity, and bodily faculties, generally, in pretty good preservation. How far this may be the effect of my way of life, adopted long ago, and steadily adhered to, is perhaps uncertain.

"I rise early; at this time of the year about half-past five; in summer half an hour or even an hour earlier. Immediately, with very little encumbrance of clothing, I begin a series of exercises, for the most part designed to expand the chest, and at the same time call into action all the muscles and articulations of the body. These are performed with dumb-bells, the very lightest covered with flannel, with a pole, a horizontal bar, and a light chair swung around my head. After a full hour, and sometimes more, passed in this manner, I bathe from head to foot. When at my place in the country, I sometimes shorten my exercises in the chamber, and, going out, occupy myself for half an hour or more in some work which requires brisk exercise. After my bath, if breakfast be not ready, I sit down to my studies till I am called. After breakfast I occupy myself for awhile with my studies and then, when in town, I walk down to the office of the Evening Post, nearly three miles distant, and after about three hours return, always walking, whatever be the weather or the state of the streets. In the country I am engaged in my literary tasks till a feeling of weariness drives me out into the open air, and I go upon my farm or into the garden and prune the fruit trees or perform some other work about them which they need, and then go back to my books. I do not often drive out, preferring to walk.

"I am, sir, truly yours,

"W. C. BRYANT."

Here, then, is a man who kept up his exercises to extreme old age, including the walking of six or seven miles a day, and with them kept up a remarkable condition of health and activity, having never been sick a day in forty years. Think of a man eighty years of age using a jumping pole, drawing himself up by the hands an indefinite number of times, then walking to his office, three miles away, and, if the elevator did not happen to be ready, walking up the nine flights of stairs, and going up the last flight, as one friend tells us he has frequently seen him, on a trot. Scores of other men of great intellectual attainments might be named who have reached old age with well preserved powers, all more or less noted for their active habits, but a few will suffice. There is James Russell Lowell who never rides when he can walk, sturdy and strong; Charles O'Connor, a rapid walker; Commodore Vanderbilt, whose erect form was daily seen on Broadway a few years ago, was a great walker; Tennyson, who is described in Miss Fox's Diary as "a grand specimen of a man with a magnificent head set on his shoulders, like the capital of a mighty pillar, and as being very brown from all the pedestrianizing along the south coast," and Gladstone, whose fame as an axeman has crossed the ocean.

Surely none of our overworked professional or business men will plead that they cannot afford a few minutes' time, upon first arising in the morning and just previous to retiring at night, to devote to work that promises to pay so handsomely, and if they will not so arrange their work as to spare half an hour or an hour sometime during the day for a good brisk walk in the open air they scarcely deserve good health.

What now can we do for my legal patient, suffering from dizziness, indigestion, etc.? Well, if he insists on keeping to the suicidal pace at which he is going—little or nothing; but see to it that he has a well-conducted funeral and an appropriate obituary, bewailing the "Mysterious Providence" that removed him. But if he will heed the suggestions given here, taking a little brisk exercise both in-doors and out every day, thus enabling the system to use up and remove the waste material, spend as much as possible of his time in the open air, and sleep more, we can promise him, with a reasonable degree of assurance, a return to health and the enjoyment of life and the ability to get through, with ease and comfort, the work that is now breaking him down, or at least as much of it as any sensible man should undertake to do.

For women suffering with sensitive nerves and general failure of vital power from deficient muscular exercise of a health-giving kind, much the same course should be adopted, but with a larger proportion of out-door work. I feel that I cannot urge this question of out door exercise, especially walking, too strongly. However confining the occupation of the man, he is obliged occasionally to go into the open air in passing to and from his place of business; but with woman engaged in her household duties, the care of her children, etc., she rarely thinks of taking a walk for the walk's sake, and frequently passes day after day without going beyond the threshold of her own door; and when she does go she is fettered and obstructed in her movements by the requirements of dress and fashion. Let her go at the afternoon's walk with a will, as she would any other duty she had to perform, first divesting herself of all articles of clothing that will in the slightest degree interfere with the free play of the muscles, or the perfect expansion of the lungs; let what she retains be as light as the state of the weather will permit, and let her wear good, sensible, low-heeled, broad-bottomed shoes. Now let her step off at a good, brisk pace, a short distance to begin with, but increasing it a little every day, as the strength comes, until she can cover three or three and a half miles an hour for two hours without great fatigue, always walking briskly and with the shoulders thrown back, head erect, and lungs well filled at every inspiration. Upon arriving at home, if perspiring let her rub her body with a towel until dry, and then take a bath of only a few moments' duration in cold or nearly cold water, rubbing until thoroughly dry and warm. Let her continue this steadily and I am ready to warrant that the blood will begin to course through her veins in a fuller stream and of a better quality, that her eyes will begin to sparkle and her cheeks to flush, her appetite to improve, and her "nervousness" to disappear, and altogether to be so changed for the better as to scarcely recognize her former self. Now she will get through the duties of the day with ease and pleasure, and should any occasion occur for prolonged effort or extra strain upon her, as the sickness of a loved child, she will be prepared to meet it and care for the loved one without herself breaking down.

In conclusion let me urge the importance of a more general and practical attention to this subject. The march of civilization is carrying us farther and farther away from the condition of our forefathers who lived nearer to nature,

and who wrested direct from the soil the means of sustenance, and with them hardy, robust, enduring bodies.

While there are great advantages accompanying this civilization, it may also carry with it its disadvantages. Let us remember that the fall of the Roman republic was caused, not from outside pressure, but from internal effeminacy and vice. Let us remember that young men and young women who enter upon life with well-trained mental and moral natures, supplemented by strong, well-made bodies, who look out upon life through the medium of senses and a brain, fed by healthy, oxydized blood, are those best fitted to combat successfully the temptations of vice and immorality. Let us counsel in this matter a breaking away from deteriorating influences of civilization, and a return to nearer a state of nature, assured that

"Nature never did betray
The heart that loved her; 't is her privilege,
Through all the years of this our life, to lead
From joy to joy; for she can so inform
The mind that is within us, so impress
With quietness and beauty, and so feed
With lofty thoughts, that neither evil tongues,
Rash judgments, nor the sneers of selfish men,
Nor greetings where no kindness is, nor all
The dreary intercourse of daily life,
Shall e'er prevail against us, or disturb
Our cheerful faith that all which we behold
Is full of blessing."

The convention then adjourned until the evening session.

SECOND SESSION, TUESDAY EVENING, APRIL 11, AT 7:30.

The convention was called to order and the minutes of the preceding session were read.

The first paper of the evening was by Arthur Hazlewood, M. D., of Grand Rapids, member of the State Board of Health, on The Prevention and Restriction of Diphtheria and Scarlet Fever. It is as follows:—

THE PREVENTION AND RESTRICTION OF DIPHTHERIA AND SCARLET FEVER.

BY ARTHUR HAZLEWOOD, M. D., OF GRAND RAPIDS.

LADIES AND GENTLEMEN:—By the courtesy of your committee, I am invited to read a paper before you on the Restriction and Prevention of Diphtheria and Scarlet Fever. The two diseases mentioned have doubtless been classed together by the committee, because of their common communicability and destructiveness to human life, especially in childhood, although in symptoms and complications they have much in common. It is not necessary to give you any harrowing details of the terrible effects of these diseases,—we are all too familiar either in our own homes or in those of our friends and neighbors, of their long list of victims. To bring the matter before you tersely, a few figures will not be amiss. From the report of the Register of Vital Statistics of our State, the large number of deaths from diphtheria and scarlet fever are sufficient to excite serious attention:—

	1875.	1876.	1877.	1878.	1879.	1880.
Small-pox	26	76	102	6	6	3
Scarlet fever	423	399	404	429	418	370
Diphtheria	207	311	593	877	1,473	1,542

For the corresponding years in Minnesota:—

	1875.	1876.	1877.	1878.	1879.
Small-pox	0	0	2	7	0
Scarlet fever	265	362	217	199	225
Diphtheria	226	379	370	658	951

In New York city, scarlet fever and diphtheria for corresponding years gave this mortality:—

	1875.	1876.	1877.	1878.	1879.
Scarlet fever	514	891	983	1,099	1,477
Diphtheria	2,329	1,750	951	1,007	671

Such statistics might be multiplied indefinitely. Minnesota's deaths from diphtheria were 13 per cent of deaths from all causes in 1879, and the largest number of deaths from any one disease. Such facts speak volumes. Scarlet fever and diphtheria are both communicable diseases, although many have considered the latter not so. More extended experience has often caused members of my profession to change their minds. In this connection the following may be interesting:—

Dr. Wm. Bunce, of Oberlin, Ohio, "was called May 1, 1881, to see a boy four years of age, of German parentage, and one of six children; he was found to have diphtheria. On the following day the youngest daughter, 2 years of age, presented symptoms of the same disease, and on the next day the father and two more children were attacked. After this date all the other members of the family except the oldest boy, contracted the disease. A thorough examination of the house elicited no source of contagion, but in the barn a cat was found having the characteristic lesions of diphtheria. On inquiry, he ascertained that this cat during its period of sickness had been played with by the children. August 20, 1881, with another physician, he saw a lady 18 years of age, who had diphtheria of a very severe type, which terminated fátally on the 3d day. In a short time the disease developed in the mother and remaining two daughters. A half-grown cat in the room was found to have well-marked diphtheritic membrane in its throat; it was also ascertained that its mother and four other kittens had been in the same condition. The girls had endeavored to cure the cats by removing the deposit, in this way exposing themselves to the contagious influence of the disease. After the recovery of these cases and the removal of the diseased animals, the spread of the disease ceased."

In Minnesota a family of twelve, children and parents, "slept in one room in a small log house. All the children had diphtheria and four died. * * * From there it was carried to Spring Valley. The first case proved fatal; it was not considered contagious; a public funeral was held at which a lady with two children was present. She lifted the children above the casket that they might view the remains. The lady and her two children were dead from diphtheria in less than two weeks. A severe and fatal epidemic followed. A lady from Spring Valley went on a visit to Austin, taking her two children with her. The children, previously exposed, were taken sick soon after reaching that place, and Austin was visited by a prevalence of diphtheria."

The first case in a village was in June. The disease spread slowly during the summer. "School opened early in September, but the children from the affected families did not attend for several weeks. October 15 a little girl came down in school. In less than a week eight others had the disease, all children in the same department of school. Step by step it could be traced from family to family up to this time. Before the disease was crushed out, which was done by strict quarantine, fifty-five cases had resulted in the village, with twenty-two deaths, besides fifteen or twenty additional cases in other neigh-

borhoods, accounted for every time by exposure to the disease either in town or country."

"In the fall of 1879, just after the fires were started and the doors closed, diphtheria made its appearance among the clerks of a large dry-goods establishment. Within two or three weeks twenty-five or thirty had been attacked by the disease and four had died. It was found that the soil-pipe leading to the street sewer had parted, and that sewer gas had freely entered the building. The old pipe was replaced with new, and extended to the top of the building. Then there were no new cases of diphtheria in that locality."

"An American family of ten persons, parents and eight boys, aged from two to twenty, were living on the highest point of a bluff. There was no lack of good drainage; a stone, allowed to roll in almost any direction, would go hundreds of feet, either down the bluff in front, or into the ravine behind. The little frame house, seen in the distance, appears to be a small shanty on the top of the mountain. In February, 1881, this family was attacked with malignant diphtheria. * * * All except the parents had the disease, the oldest three and the youngest lightly, the other four dying within a week from the time of attack. * * * While here there could be no want of good air outside, and no dampness under the dwelling from want of drainage, nevertheless the following conditions were present: A small house, banked high around the walls with straw and manure, a large family confined almost wholly to one small room, with rather scanty bedding and clothing, trying to make themselves comfortable during a long and very severe winter, by excluding the cold air from the close living and sleeping room. The water was obtained by melting snow, or was drawn from the lake at the foot of the ravine, and kept in a barrel in the corner of the room. In the sickness of this family, before any sanitary work was done or curative measures adopted, one had died and two others were in a hopeless condition, and one died of croupous diphtheria more than a week after the best sanitary measures possible under the circumstances had been adopted. A case of malignant diphtheria is like a house on fire, the destroying flame must be extinguished early if at all." A Mr. J. P. and wife were summoned to the house of their sister whose family was suffering from diphtheria, remaining until after the two children were buried. Returning home a distance of over forty miles, by wagon, and the weather very cold, what was more natural than for father and mother to fondle their own little ones? But alas! their kisses were contaminated, were loaded with poison, and two little graves on the hill-side within ten days was the result. All three of the other children were taken with diphtheria within four days after the arrival of the parents. Up to this time there had not been a solitary case within six miles of this family. There had been no other chance of exposure. The parents were intelligent people and believed in contagion, but thought so long a drive on a cold day would surely destroy the poison. Mr. N. P., wife and infant, attended a wedding, sleeping in the same room where three children had died three or four months previously, and nothing had been done to disinfect the house. The fourth day after their visit their little one had well marked diphtheria and in three days died."

Scarlet fever is more generally recognized as communicable. It is to some minds surprising how long the germs may remain potent. A prominent physician of this State some years since mentioned in conversation that some children of his were suffering from scarlet fever, and added he believed that a coat worn by him six months before to attend cases of communicable diseases was the means of infection; said coat required some repairing, and he took it home for the purpose, said repairs being made in the family sitting-room;

some of the binding had to be removed, and his opinion was that the germs were then set floating in the atmosphere. Another case. One of three sisters, married from an eastern home, went west to live, and died of scarlet fever; some of her clothing was sent to her home, where the sisters altered and wore it. They were both attacked with scarlet fever, but recovered, and as there were no younger persons in the family the disease did not spread that year.

Scarlet fever is communicable to others so long as there is any peeling of the skin, and as the finest particles are not very appreciable, it is necessary to wait for two weeks after the peeling has seemed to end before it is safe to allow the convalescent to mingle with other persons. Children are more susceptible than adults, and "have been inoculated with the serum found in the vesicles which sometimes accompany the rash, and have taken the disease.

"Bell ascertained that several cases of scarlatina had occurred in all houses—with the single exception of one occupied by old ladies—to which milk had been conveyed by a peasant and her son, the milk boy, who had both undergone attacks of scarlatina, and he therefore asks whether the milk, the receptacle, or the boy was the medium. Taylor observed that one of the first severe cases which initiated an epidemic occurred in the house of a milkman, whose wife milked the cows, the milk being supplied to about twelve families in the city. In six of these, cases of scarlatina occurred in rapid succession, at a time when the disease was not epidemic, and without any communication having taken place between those that became affected and the person who had brought the milk.

"In the summer of 1879 there were 35 cases of scarlet fever in 18 families, and 24 of the patients were taken sick within 36 hours. Every one of those families obtained their milk from one and the same source, while neighboring families, which were supplied from different places, had no cases of the disease. It was found that the persons employed in milking the cows lived in a place where there were cases of scarlatina, and the question still remains, did not the man who carried the milk also carry the contagion on his own person, as the possibility that he may have been in direct contact with the poison of the sick cannot be excluded."

Ziemssen says: "It is an undisputable fact that unaffected individuals who have nursed scarlatinous patients can spread the contagion, probably through the medium of their clothing," and that "the scarlatina contagion has extraordinary tenacity."

Having now, I think, sufficiently proved the communicability of these diseases, it is time before you are too much wearied to talk of the restriction and prevention, and to avoid misunderstanding my explanation of the two large words used will be *Restriction*, to keep from spreading, and *Prevention*, to keep away from or out of.

How is prevention to be accomplished?

Accepting the communicability of these diseases as proved and presuming that rarely if ever cases arise spontaneously, the most obvious plan would be that of non-intercourse with other places. Such a plan, however, would so materially interfere with trade, travel, and general welfare as to be impracticable, except for a limited time and with a limited number of places. What, then, must be our remedy? Physicians generally are agreed, I think, that a healthy individual can and will to a greater or lesser extent throw off a certain amount of poison to which he may have been exposed. This ability to throw off disease depends on the sanitary surroundings of the individual. The different conditions of domestic life, the industrial pursuits, and any influences

which are likely to prejudice the health in general, have a large influence in occasioning an outbreak of diphtheria or of favoring its spread.

"The development of a zymotic disease is particularly favored by poverty and uncleanliness, and when diphtheria first invades the hovels of the poor, where the air is impregnated with animal emanations, where men and animals are crowded together under the same roof, and dung-hills, privies, and other sources of animal putrefaction fill the air with their effluvia, it only follows the general law. Living in damp dwellings and in rooms on a level with the earth's surface seems to exert upon children a similar evil influence, and these hurtful conditions, as well as the fact that the disease is wont to break out in rooms, factories, schools, barracks, etc., which are insufficient in size and over-crowded with human beings, have been proven, especially in the epidemics in England and France. "The rich and cultivated offer a large contingent of victims to the disease, persons who are either anæmic or weakened by previous sickness, or through high living suffer from a plethora, and such as have lost their health through dissipated habits of life." It speaks for itself, then, that every householder should first see that his own family have healthy habits and surroundings and then look after his neighbors.

Dr. Elisha Harris of New York says in an article entitled "A Medical View of the Domestic Pestilences," "now, as the result of observation, we know that if families with the contagion of diphtheria brought to them, and having in themselves a susceptibility to the disease, instead of living in the observance of hygienic laws and in the midst of good sanitary surroundings, had at the same time been subjected to the evil influences of bad air, impure water, and unwholesome food, 'tis easy to believe that the destructive power of the disease would have been greatly increased. The practical question now is, to what extent are the causes of disease in cases where unavoidable exposure has occurred, preventable?

"*First*, Good regulations, rigidly enforced, would render the chances for children to contract diphtheria far less than is the case at the present time.

"*Second*, Every intelligent person in the State should be so instructed and impressed that no one should be allowed to nurse cases of diphtheria or scarlet fever and go directly from the infected house into the presence of a family of children. There should be no public funeral in case of death from diphtheria or scarlet fever.

"*Third*, the unsanitary conditions of air, water, and food, which not only intensify zymotic disease, but are often the especial causes of the same, are in a great measure remediable.

"*Fourth*, if good sanitary regulations were rigidly and generally enforced, and hygienic laws observed, may we not suppose that individual susceptibility to disease, especially of the zymotic classes, would be greatly lessened among all classes?"

A very interesting account of an epidemic of scarlet fever near the Mystic river, Connecticut, states, "for two years in succession the summer had been unusually dry and the river low. There was stated to be a large escape of offensive gases on stirring up the bottom of the river, and in some places it was asserted that these would at times arise quite freely without any such disturbance. The cause of this odor was found to be the decay of brush, mainly white birch brush that had been put in the river for oysters to set upon. The preceding summer the oysters, which had set freely upon the brush, died. This added an increased source of ill odor to the next summer's share. By the general laws of diffusion these gases were scattered over the valley to the

adjacent hillsides. If filth does not directly produce disease, one thing is settled beyond a peradventure, it does render it of a more severe and malignant type, and furnishes the conditions most favorable to an epidemic.''

The experience of Grand Rapids during the past eleven months may not be uninteresting. As many of you are aware, our city is divided by the Grand River, the west side being level and scarcely higher than high water mark; the soil is for the most part saturated with water, often to within a few inches of the surface. The east side rises more decidedly, and the bluffs being much nearer, a large part of the city is upon high ground. From as reliable data as as I can find, the estimate of population in the three wards on the west side is about 11,000, and of the five wards on the east side about 25,000, with the difference in soil moisture. The cases of diphtheria reported are about one to every seventy-six inhabitants on the west side, to one in 120 on the east.

From all this mass of evidence it appears to be as certain as any fact which is not able to be proved by the rule of thumb, that to prevent the entrance of scarlet fever and diphtheria into our homes,—and the same may be said of several other diseases,—such hygienic precautions must be taken as will insure pure air in sufficient quantity, and wholesome water. To this end, when houses have cellars, they should have bottoms that will keep out the moisture from the soil, be thoroughly ventilated and kept clean and free from decaying substances. Where houses have plumbing fixtures the same should be well ventilated and trapped. The school life of children should be carefully watched, and proper inspection of the buildings should be periodically made, that a proper relation of the space and individuals is maintained, that light, heat, and ventilation are properly cared for, and further to prohibit the attendance of any child from a house where anyone is suffering from an infectious disease. The health officer should also be a school inspector, and visit any suspected case of sickness happening at the school, or in the absence of an attending physician in other cases of sickness at the homes of school children, that primary cases of communicable diseases might be observed and prevented from spreading.

For the restriction of these diseases, all that can be said concerning the prevention is equally applicable. In addition, however, there are some important points. When a case of communicable disease occurs, of which scarlatina and diphtheria are the types, thorough isolation of the patient should be enforced—in many houses it is practicable. I was called to see a domestic in the family of one of our prominent citizens and found it to be a case of scarlet fever. The question at once arose, what was to be done? The family was composed in part of young children, the girl's home was some miles distant and also had in the family young children with but scant means of isolation. The lady of the house agreed with me that the risk was greater to the community to send the patient away than to let her remain. Fortunately the patient's room was in a wing and up stairs, separated by double doors from the main part of the building. The case, although severe, was not an alarming one. The lady constituted herself nurse, and, whenever she visited the patient, donned a linen over-garment which she put off again upon leaving the room, hanging it in the space between the double doors and having it subjected to the fumes of chloride of lime constantly when hanging. Thorough ventilation and disinfection was practiced in the apartment during the sickness; and subsequently, after the recovery of the patient, fumigation and cleansing; and no other case followed in the family.

A similar plan was adopted in a case of diphtheria under almost identical circumstances. This proved to be a malignant case, and yet no other mem-

bers of the family were affected; but some of the girl's friends, I heard afterwards, became sick with the disease from wearing garments belonging to the patient before disinfection. But, of course, such a plan is not always practicable. When it is not, the family, as a whole, should be isolated, and, in tenements, the entire house. I see by a late journal the authorities in New York propose a hospital for scarlet fever, measles, and diphtheria; and in all large cities, where there are many tenements, such a hospital should be provided, that the burden should not fall too heavily upon a poor family free from any disease but living in an infected house. Such hospital should be made attractive and permit the mother to remain with the child and have their own physician. By such means it could not happen that a child would attend school from an infected house, providing due notice was given. Our State law contemplates that the physician and householder should give notice to the health officer or local board of health of all cases of infectious diseases, and this should be suplemented by reports to school superintendents and teachers, giving name of patient, number of house, and name of street, that the teacher may at once know if any exposed child is present and excuse at once any so exposed. Such reports should be sent daily. In all large cities also the health officer should be required to visit any suspicious case or cases reported as having no physician, that it might be known whether a case is one of a communicable disease or no.

All funerals of persons who may have died of communicable diseases should be private, the body enclosed in disinfectants and a tight coffin and buried within twenty-four hours. No child should be permitted to attend such a funeral.

Disinfection during the sickness, and fumigation after the recovery or removal of the patient, for which precise directions are given in a document issued by the State Board of Health. [See pages 211–218 of the Report for 1881.]

That such measures are not impracticable nor unsuccessful, the report from Dr. James Crane, of Brooklyn, amply proves, although the City of New York has had no diminution of scarlet fever during the nine months of 1880 for which the report is made, and in both cities the diphtheria has held its ground. In scarlet fever cases, a decided lessening of the number in Brooklyn occurred; the preceding six years gave never less than 1,600 cases and from that to 2,800; the nine months of 1880 show but 930 cases, and this experience indirectly, I think, proves the greater contagiousness of scarlet fever, aside from unhealthy surroundings, than diphtheria.

From all this it follows that no communication should be had with patients sick with these diseases by the parents or guardians of children. Yet as in many cases families might die from lack of care if no one was willing to visit and nurse them, this rule should not be a bar to those whose children are grown up or away from home, or who are without any. After adult life is reached the danger of contracting the disease is much lessened, and a large majority of the cases in adults are not necessarily fatal, so that the calls of humanity and friendship may be attended to without undue jeopardy, providing proper disinfection is carried out and such persons acting as nurses and attendants avoid the homes where children live or visit until after a thorough disinfection of themselves and their clothing is performed. To facilitate this, it is best, while acting as nurses, either to wear clothing that can be boiled, or which has become of such small value as to be destroyed by fire without loss.

The next paper was by Leartus Connor, A. M., M. D., of Detroit, on How can we Obtain and Preserve the Best Eyesight and Hearing. This paper was illustrated by models of the eye and ear, and much of it was a verbal address. The written portion is as follows:

HOW CAN WE OBTAIN AND PRESERVE THE BEST EYESIGHT AND HEARING?

BY LEARTUS CONNOR A. M., M. D., OF DETROIT.

Were this inquiry made of every living, rational adult and every answer recorded, we should be able to classify them thus:

(1.) The great mass of persons would say, "we neither know nor care, 'tis enough that we now hear and see so as to provide for our present wants.''

(2.) Another large class would reply by telling us the anatomy and physiology of the eye and the ear and by recounting the connections of their activities with the education, with the pleasures, and with the profits of social, business, and moral relations.

(3.) Lastly, a considerable number who have lost in part or whole one or both of these senses, would give us a very practical and very earnest injunction that "with all our getting we should get the best eyesight and hearing and so care for them that they may serve us while life lasts."

So little is the importance of these senses realized that even the beasts of burden are better treated than are the eyes and ears of human beings. Horses and oxen are not generally compelled to work until they have attained maturity. Then care is ever taken that they be worked only under such conditions as shall keep them strong and well. But human eyes and ears are put to severe labor long ere they are fully developed. Then the conditions under which they very often labor are such as directly to produce weakness, actual disease, or early destruction.

A complete answer to our query is impracticable in a brief paper suited to the present occasion. But a few suggestions of a practical character may prove helpful to some who desire to make the most of their special senses. The form in which we shall try to make these suggestions is such as to be within the easy comprehension of every intelligent person.

First. We can only obtain and preserve the best eyesight and hearing "by acting as if they were of more value than any other things on earth."

Whatever theoretical views are held, practically the mass of the people regard the best eyesight and hearing as entirely secondary to other considerations. To illustrate. The baby cries from ear ache. If hearing were regarded by the parents as of the first importance, they would have the case scientifically examined and treated by the most approved modern methods. But as a fact, what do they do? Usually they fill the ear with oil of some sort, with laudanum, with solutions of camphor; they apply poultices of onions, of bread and milk, potatoes, etc., etc. If, after such abuse, the ear begins to discharge, they adopt some ignoramus' notion that if the discharge be stopped it will go to the brain and the child will die. Hence they cherish this offensive flow from the child's ear until the age of manhood or womanhood is reached. Meantime the whole life of the child has been darkened by the shadow of this offensive discharge from the ear, of its attendant deafness, and of the

inevitable chronic blood-poisoning, and by the constant danger of death from the extension of the inflammation to the brain. How great this shadow is only they can tell who have been doomed to such a dreadful experience. Why, during all these years, did not the parents take the trouble to have the case scientifically investigated and cured? Simply because they regarded other things as of more importance than this ear. Here and now it does not matter whether these things were money or time, or trouble, or simple ease. The effect was the same, the ear was destroyed, it was made a fountain for the outflowing of most poisonous liquid, offensive alike to the child and all its associates. The physical, mental, and social life was dwarfed and distorted, simply because the parents did not regard the ear of their child of so great importance as some other things.

Again, at the first teething a child's eye begins to turn inward. This lasts only for a little time, but gradually it continues longer and longer until it is permanently located so that there can be no distinct vision from the affected eye. It is apparent to all that the eye is out of order. Well, do the parents at once secure for the child the best knowledge and skill that is to be had? Not at all. Usually matters are allowed to continue until one eye has become almost if not entirely blind, from simple non-use. Possibly now, if they find it will not be much trouble, or that an operation can be done for nothing at some free surgical charity, they will have the case investigated and use some of the measures proposed for the relief of the deformity. Apparently there is little regret that one eye has been entirely lost by simple neglect. Clearly these parents did not regard the eyesight of their child as of the first importance. Illustrations of our proposition are simply numberless. While they exist it is absolutely certain that we shall never have the best possible eyesight or the best possible hearing until we come to regard the value of the special senses as more important than money, than ease, or pleasure, or even ambition, or anything else. I do not affirm that it may not be possible for circumstances to arise in which it may not be best to sacrifice the eyesight or the hearing for the attainment of some other end. But I am quite sure that in the end life will be the most satisfactory to such as retain the integrity of the special senses equally with that of the other organs. In its relation to these organs a sound physiology shows that the best eyes and ears mean the very best health of every part of the body and mind. Hence there is no need to sacrifice other parts of the body to save the special senses. The sacrifices of the eyes and ears are rather made in favor of some work or play, or some pleasure, or some vice that harms other portions of the body at the same time that it does the eyes and ears.

In the interests, not only of the eyes and ears, but in the common interest of the entire human body, we must affirm the following proposition. If any calling, if any pleasure, if any work, if any ambition, or if any other thing call for the sacrifice of the health of the eye or the ear, better save the latter at the expense of the former. At any rate only by following this course can the best eyesight and hearing possible for us as individuals be obtained.

Accepting this principle of action, what specific measures will we be called upon to follow?

A.—As soon as a child is old enough to be given specific tasks to perform, we will have his eyes and ears carefully examined. This examination must be by a competent person. It will determine whether these organs have any specific defects. If there be no defect then in so far as these organs are con-

cerned the child may be permitted to enter upon any course of study or life that its circumstances and opportunity permit. But on the other hand, should either organ be found very defective, certain callings must be excluded from the future of this child. Thus, if the ears were defective in the power of appreciating tones, time, and rhythm in different sounds, surely it were useless to waste time and money in the vain endeavor to follow a musical career. On the other hand the ears of a certain individual may be found to excel in these and other qualities, and hence in these respects he may be fitted for a success as a musical artist. The eyes may be found defective, in the shape of the eyeballs (too flat antero-posterior, too convex from antero-posterior, or too flat from side to side). The lenses may be partially clouded, the proportion between the circular and longitudinal fibers of the ciliary muscles may be out of harmony with the rest of the structure of the eye. The muscles outside of the eyeball may be disproportionated to each other and to the ciliary muscles, or color blindness may exist. On the other hand the eyes may be found, humanly speaking, perfect. Evidently a career based upon a perfect eye would fail of its best success, were the eye imperfect.

The number of wrecks of lives from this cause that appear before those conversant with the diseases of these organs is simply astounding. The worst feature of these wrecks, is that the cause of the wreck is not discovered until the damage is done, and it is too late to enter upon another course of life with success.

If it be known exactly what defects exist in the eyes at an early period of life, when school education begins, the task laid upon such eyes can be proportioned to the ability of the child to bear them. Thus out of a class of fifty children there may be ten with more or less defective sight and hearing. Certainly these will be very likely to break down sooner or later in the strain placed upon them by the ordinary duties incident to ordinary school life. It is scarcely fair to lay all the blame of these wrecks upon the machinery of the schools. Given a perfectly sound body and perfectly sound special senses, and but few would suffer as to their eyes or ears even in the defective school machinery that now exists in our public school system. By all means make this machinery so perfect that none will suffer in any degree. But do not lay to this machinery blame that properly belongs to originally defective eyes and ears. We suggest that a proper system of education would examine every applying pupil in respect to the special senses of seeing and hearing before admission to the school. Those whose defects could not be remedied by artificial measures might be taught in special classes. If it were possible to correct the natural defects by any artificial measures then such children should be admitted to the classes of sound pupils. Every year of school life the eyes and ears should be examined, as at the beginning, and any existing defects corrected as at first. In this manner of intelligent supervision, by the co-operation of the intelligent physician, and of the intelligent school board, and of the teachers, many eyes and ears might be preserved in excellent condition, that now are absolutely ruined.

Further, every teacher should be examined as to the perfection of his or her sight and hearing. It is well known that defects of these organs are very common among teachers as among all other book-educated persons. That the teachers should have good hearing and good sight in order best to accomplish their work will at once be evident to all. Many a scholar and teacher, too have suffered from the existence of such defects in teachers.

Have we made it clear that the development and the preservation of the best eyesight and hearing call for early and frequent examinations of these organs by competent persons, especially in persons whose life calls for large drains upon these organs? In this manner courses of life can be entered upon that will best favor the defective organ, and existing defects can be corrected. Incipient diseases can be recognized and relieved or cured, and so the greatest possible service can be obtained from these organs with a minimum of damage to them.

B.—Never use the eye or the ear when the use of the same causes pain in either organ or in the head.

The healthy use of these organs is entirely painless. The existence of pain is proof positive that something is wrong, in the same manner as the creaking axle, the smoking car wheel box, the rattling machinery. Common sense calls for an investigation into the causes of the pain in the eye on using it. It may be that, as in the case of the over-heated axle, simple rest will restore the organ to its power of working without pain. Should this fail, then surely common sense calls for an investigation into the causes of the pain. It may be that at this stage it can be readily removed by simple measures, such as remedying defects in refraction, iritis, weakness from use in bad light, air, etc. Should the examination reveal a serious and irremediable condition, surely the sooner this is known, and the affairs of life adjusted to it, the better will it be for all concerned.

C.—Never use the eye unless it is abundantly supplied with good blood.

Before breakfast the eye is generally ill supplied with such blood. Generally twelve hours have passed since the last meal. At least four of these hours have been devoted to more or less active work with the eyes, often this is more severe than during the day. Especially is this true of persons who perform manual labor. Besides the eight or more hours devoted to sleep still further drain from the blood its reserve of tissue-building material, and fill it with the waste substances separated from the tissues. Again, not only is the blood poor, from these causes, but the circulation of it is, on arising, sluggish and imperfect. The heart beats from ten to twenty times slower when the body is at rest in bed than when it is standing. Hence, on arising some considerable time is required in order that such blood as there is shall course freely through the tissues of the eye. Such are some of the reasons why the health of the eye forbids its severe use in the morning before food is taken into the stomach, and before some muscular exercise be had.

Plenty of good eyes have in this manner been ruined by students and others to whom such habits were a matter of convenience. The same argument, in so far as the poverty of the blood is concerned, will apply to the severe use of the eyes very late at night.

Of course, if sufficient amount of food has been digested to meet the calls for extra work, all may be well. Further if such use of the eyes be habitual, the person instinctively takes an additional amount of food for the special demand to be made upon the eyes and other organs. Still, such habits of close and constant study of books late at night, by an artificial, often flickering, light, and in a more or less foul atmosphere, is unfavorable to the best health of the eyes.

Again, the eyes are ill supplied with good blood when the body is in a state of exhaustion, hence the eyes should be used very sparingly, if at all, after a hard day's work, or when a state of exhaustion has been produced from any

other cause. We suspect that very much of the harm done to the eyes of school children is produced in this manner. The child is required to sit in a constrained position perfectly still for so many hours that it becomes exhausted. During and after this exhaustion it is required to at least keep its eyes fixed upon fine print, in a foul air and more or less imperfect light. The constrained position interferes with the proper circulation of the blood through the working tissues of the eyes. Is there any wonder that after a time these tissues should fail to do the work of well fed tissues? Is it any wonder that such tissues follow the same general law of all living structures, when overworked, break down? The principle is just the same as trying to get from a half starved horse the work of a well fed one. All horsemen know that such an attempt is likely to end in the ruining of the horse, and a failure to accomplish the desired work; for a similar reason the eyes should be used sparingly after a severe illness.

Of the numerous other conditions in which the imperfect supply of good blood to the eye renders its severe use harmful to the integrity of vision, we have not time to speak. Bearing in mind the general principle its special application will usually be apparent to every thoughtful person.

D.—As far as possible never use the eyes for close work in an imperfect light of any sort.

What kinds of light are imperfect for purposes of vision?

(1.) Deficient amount of light, as in the early morning or twilight, or an artificial light far distant, or a very small artificial light, or light far from a window which is too small for the room and for a dark day. It is deficiency of light that is complained of in many school rooms, and no doubt with adequate reason. When the light is such as to render it difficult to see the work or print before us, a proper regard for the preservation of vision will compel the immediate stopping of the work. Of course there are different kinds of work requiring different amounts of light, but the general rule just stated will hold good.

(2.) Light may be imperfect from its unsteadiness. It is this quality that renders the electric light harmful to vision. Gas-light often exhibits a degree of flickering very trying to the eye.

(3.) The light may be steady but the car or wagon in which we are seated may move. The attempt to read in the cars is a fruitful source of injury to the eyes. Some of the worst cases of muscular weakness of the eyes coming under my care have been derived from reading in the cars.

(4.) The practice of reading while in a reclining position upon a lounge or in a bed causes the light to enter the eye at such an angle as to require an undue amount of effort in order to see distinctly for a long time. Hence such a position should always be avoided.

E.—When practicable, the light should fall upon the printed page or upon our work from the left side of the body and from behind the shoulder. In this way the movements of the right hand least obstruct the light and the rays are reflected with greatest directness from the page to the eye.

F.—Alcohol and tobacco, used to an excess, certainly have a deleterious effect upon the development of the best vision and the retention of the same.

The answer is the same now as in the days of Solomon to the query, "Who hath redness of eyes?" It is a well-known effect of alcohol for a person under its full influence to see snakes in the air and horrible things everywhere.

Germany is noted for excess of smoking in pent-up rooms, and Germany also furnishes proportionally more eye diseases than any other country. Espe-

cially is the disease known as granular lids very common there, and very difficult to relieve. That blindness as well as imperfect vision and hearing result from the use of alcohol and tobacco is well understood, but after all it is probable that more harm results in the diminished vitality of the tissues of these organs, by which they are unable properly to do the work desired of them. Those who desire the best vision and hearing will not tarry long at the wine cup, nor use much tobacco in any form.

G.—The agency of those faculties that we call mind and heart have much to do with the best vision and hearing. Especially does fretting destroy and a cheerful, happy mode of life strengthen both of these senses.

Respecting the special care of the ears, we can here make but a few suggestions.

1. Pulling of the ears, or slapping of the same, have only to be mentioned to be utterly condemned, as they are frequently followed by great injuries to the membrana tympani and other parts of the ear.

2. All attempts to clean the ear by other instruments than the finger or a piece of simple soft cloth are simply damaging to its integrity. The various instruments for cleansing the ear sold with toilet articles are very destructive to the health of the ear. In a healthy ear the wax and foreign substances grow with the superficial portions of the skin of the external ear towards the external portion. When they have reached the portion where the end of the fore finger can reach them, they should be removed, but never otherwise. Violating this rule we have the development of abscesses in the external ear, ear plugs deep in the external auditory canal, injuries to and inflammations of the drum membrane and drum cavity of the ear.

3. The introduction of all sorts of remedies into the ear is extremely pernicious. The oils being kept at the summer heat of the deeper portions of the external ear soon rot and become both irritating to the skin and the membrana tympani, and further supply the soil needful for the growth of various parasites.

4. Unless directed by competent authority no poultice should ever be applied to the ear when inflamed. Dry heat will serve to relieve pain as well as the poultice, and hot water will be better than either. Neither will promote destruction of the drum membrane as the poultice. The same is true of the eye.

5. Cold or sea water bathing is a prolific source of inflammation of the middle ear. Hence in such bathing it is wise to protect the ear from the entrance of the water into the external meatus, especially to prevent the waves from dashing directly into the ear against the drum membrane.

6. When foreign bodies get into the ear let them alone until some one can be seen who can extract them without doing more harm than good. In almost every case little harm will come to the ear from the presence in the external meatus of the foreign body, while infinite harm may come from injudicious attempts to extract it. Plenty of cases are upon record in which even death has resulted from such attempts. The only foreign substances which will not wait for skilled attempts for extraction are insects. These can usually be disposed of by filling the ear with water or oil, or better still if possible, by dropping into the meatus a few drops of ether or chloroform, and then washing out the dead or stupified insect by means of water.

7. All running ears should be cured at the earliest possible moment, in the interest not only of good hearing, but also in the interest of the individual's life. As a matter of fact most cases of abscess of the brain originate in run-

ning ears which have been permitted to continue in the hope that they would cure themselves.

8. The best of ears cannot endure the constant din of certain shops, as those of the boiler-makers. Sudden and violent explosive noises are often harmful, especially to slightly defective ears.

H.—How shall we know that the special senses are being injured by the use or abuse to which they are subjected?

(1.) Among the indications that none can fail to observe are "any redness of the edges of the eyelids, or any redness of the eyeball continued for any considerable time. Such redness is certain to be the signal of danger and should never be neglected. It may signify local disease of the eye, or general disease involving many of the tissues. Any defect of refraction may cause it, but in many cases it results from over-use of eyes in which no such defect exists. The relief of the condition depends upon the removal of the specific cause. But my point is that such redness indicates that the eyes are suffering harm.

(2.) Pain as an indicator of some disease operating harmfully upon the eye, I have already alluded to. Were its admonitions always heeded, the gain to good and prolonged vision would be incalculable.

(3.) Indistinct vision or imperfect hearing should at once lead to an investigation of the cause or causes and their removal at the earliest possible moment. These causes are numerous. Some are trifling in nature and harmless to permanent vision or hearing. Others are of vital importance. All are familiar with the story of the fisherman and his son who, on a bright day drifted into the outermost circles of a mighty whirlpool. Vividly you recall the scene of their careless mein and the joy experienced in the motion of the boat without any effort at the oars. Thus in part dreaming and in part watching the magnificent scenery and mighty whirlpool at a distance, they glided onward. Busied with pleasure and with thought of future gains and success in their enterprises, time slowly passes; as slowly does the boat enter one after another of the circles of the whirlpool; it moves swifter and swifter, but so slow is the increase that it simply serves to keep up the first pleasing sensations. Yet with thoughtless hearts they approach nearer and nearer the awful vortex. Suddenly a sense of danger comes over them. They spring to their oars; with the strength of desperation they strive to turn the boat from its onward deadly course, but their efforts are vain; the forces drawing the boat to the center of the vortex are stronger than their arms. Suddenly, under the strain of a stronger pull an oar breaks, and then another. With howls of despair rending the hearts of powerless spectators on the banks, the occupants of the boat are hurled swiftly onward to their doom.

Faintly this images the listlessness with which the victims of certain affections of the ear and eye while away the time, when escape from absolute deafness or blindness is possible. Faintly it pictures the insidious approach of the death forces, their awakening to a sense of danger, their frantic but hopeless efforts to escape, and the final closing of the scenes by the forever shutting their ears to sound and their eyes to light.

It is not possible for us here and now to describe these diseases. It suffices for our purpose to state distinctly that gradual failure of these senses without adequate reason is sufficient cause for a thorough awakening to an investigation of the cause of this failure. One of the worst and most dangerous forms of ear diseases has scarcely any other symptom appreciated by the subject of it than a gradual indistinctness of hearing. So also some of the most fatal

of eye diseases begin with a gradual failure of vision. Its subject thinks often that he or she is simply growing old. They haunt the spectacle-vender, the so-called optician, trying to get some glass that will relieve the annoying loss of vision. But after a little, even with the best fitted glasses the vision fails as before, until no glass will improve the sight. At last, when it is too late to save vision because the vision has been destroyed, they resort to the oculist and are told that there is no hope, the retina having been destroyed by the disease.

4. Frontal and others forms of intractable headache sometimes are almost the most prominent indication of some serious disorder in the eyes. At least when all other measures have failed to relieve this condition, an examination of the eyes may reveal the source of the trouble. Our point is that such headaches lead to a suspicion that the eyes are being injured. Such suspicion indicates that the eyes should be examined for the probable reasons of the headache.

Thus, we have in brief alluded to some of the measures by which we may obtain and preserve the best eyesight and hearing. It will readily be seen that the care of these senses in infancy is the condition of obtaining the best vision and hearing in all succeeding periods of life. So, also, the proper care of these senses in youth obtains for the rest of life the best vision possible. Hence, the proper care of these senses at any one period of life, obtains for coming periods the greatest usefulness and power of these senses.

Aside from the proper use of these senses in and of themselves, it will be apparent that the best health of every organ in the body and the most perfect performance of every function will very materially aid in the obtaining and preserving of these senses.

Especially is this true of the brain and nervous system. By numerous nerves these special senses are connected with the brain, the spinal cord, and the so-called sypathetic ganglia. Especially are the groups of cells in the cerebrum, in which the optic nerve fibres take their direct and indirect origin, intimately blended with the proper action of the senses of seeing and hearing. Only as these cells are well nourished, and kept in the most perfect order, can we expect to have the best activity of the special senses. We do not see with the organ we call the eye, nor do we hear with the organ we call the ear. Both of these may be anatomically perfect, and yet the possessor be as blind and deaf as a mummy. It must never be forgotten that we really see with the brain, and we really hear with the brain. The so-called organs eye and ear are merely the means by which light and sound can be transmitted to the brain cells. Hence, it is impossible to obtain the best eyesight and hearing without the most careful attention to the nutrition of the brain. Hence, the evils to young and growing brains which follow keeping them in such positions, in such air, and in such confinement as render the proper nutrition of the brain impossible. It is worse than useless to have the eyes of pupils directed to the printed page when the condition of the brain cells is such that it is impossible for them to receive and appropriate the impressions made upon the retinal elements. That alone is book study in which the brain cells receive and utilize the impressions made upon the retina. That is not hearing when the sound waves stop short of the brain. Popularly it is said that such ideas go in at one ear and out at the other.

Children should not be received into school unless their brains are in a well nourished state. They should be sent out of doors, or home as soon as the

nervous system becomes exhausted. All attempts to compel study under such a condition are simply harmful and useless so far as learning is concerned.

So intimate are the relations of the teeth to the eyes and the ears that few serious disturbances of the health of the teeth fail directly or indirectly to more or less weaken or actually cripple these organs.

Again, a disturbance of the stomach or other digestive organs reacts more or less upon the integrity of vision and hearing. Imperfect exercise of the muscular system is attended by imperfectly developed brain, and both directly and indirectly affects the powers of vision and hearing.

Most prolific of similar and even more grave troubles of the eyes and ears are the numerous and common troubles and abuses of the sexual apparatus.

To sum up in one sentence this part of our subject, the obtaining and maintaining of the best vision and hearing imperatively call for the normal and healthy action of every organ in the body. We are entirely familiar with the fact that persons have serviceable eyes and ears while they are subjects of organs constantly suffering physiological abuse, but we know that the vision and hearing of such are not the best that they might have. Fortunately or otherwise there is given to most a large surplus of vision and hearing above that which is called for by the ordinary exigencies of life. This surplus may all be squandered without the individual's feeling any inconvenience unless some emergency arises calling for some of this physiological reserve.

To sum up what we have suggested in plain propositions, the best eyesight and hearing can be obtained and maintained by—

(1.) By acting as if the eyesight and hearing were of more importance than any other thing on earth.

(2.) By having every child's eyes and ears carefully examined by an expert before it is given specific tasks to perform calling for the full exercise of healthy eyes. If the eye or ear be found defective then by grading the tasks according to the nature of the defect.

(3.) By never using the eye or the ear when such use causes pain in either organ or in the head.

(4.) By never using the eye when it is imperfectly supplied with good blood, as before breakfast, when utterly exhausted, after a severe illness, etc.

(5.) By never using the eyes for close work in an imperfect light, as in early morning or evening twilight, by a very distant and weak light, far from the window on a dark day, etc.

(6.) By utterly avoiding the use of tobacco and alcohol, except for medicinal purposes.

(7.) By always cherishing a cheerful habit of thought and feeling towards all persons and all events.

(8.) By avoiding all such injuries to the ears as result from slapping, pulling, and very loud and sudden noises.

(9.) By keeping out of the external ear all things smaller than the forefinger, or stiffer than a towel or handkerchief.

(10.) By keeping out of the ear all oils, all soaps, all cold water, and everything else recommended by sympathizing but mistaken friends; especially never apply a poultice to the ear for the relief of pain. Dry heat will do all that moist heat can to relieve, and be free from the danger of absolutely destroying the membrana tympani.

(11.) All running ears must be cured at the earliest possible moment, at the peril not only of the hearing but that also of the life.

(12.) By heeding the warning given by redness of the eyelids and of the white

of the eye, by pain in or about the eyes or ears, by the continuance of indistinct vision for any considerable time, or of imperfect hearing, by the continuance of a frontal headache after usual remedies have failed to relieve it.

(13.) By regarding the eyes and ears as simply a part of a very complex system of apparatuses, the best health of all being absolutely needful for the best health of each.

(14.) By remembering that we do not see with the eye or hear with the ear but with the brain. Hence after the brain is exhausted it is impossible to really see or hear. Hence the utter absurdity as well as perniciousness of any endeavor to see or hear after the brain has become exhausted. Especially is this true of young and growing brains. Here, too, it is needful to remember that the normal brain continues to grow until about the age of forty.

103 Cass St., Detroit, Mich. LEARTUS CONNOR, M. D.

On account of the lateness of the hour, the next address was postponed until some future session.

Third Session— Wednesday morning, April 19, at 9:30.

The convention was opened with prayer by Rev. A. A. Brown of Greenville. The first paper was on "The effect of overflowed lands upon health," by Dr. Gillam of St. Johns. It is as follows:

EFFECT ON PUBLIC HEALTH OF OVERFLOWED LANDS ADJACENT TO MAPLE RIVER.

BY S. E. GILLAM, M. D., OF ST. JOHNS, MICHIGAN.

Maple River, naturally a beautiful and healthful stream of water from its source to where it enters Gratiot county, after which, the country being flat and level, the stream becomes more sluggish, but no worse than many others running through a section of low land, takes its origin in the township of Bennington, Shiawassee county, taking a N. W. course, enters the county of Clinton, crossing Ovid, until it reaches Sec. 19, Duplain; running from there N. E. and N. to Secs. 22 and 27, township of Elba, Gratiot county, where it makes an abrupt turn to the W. and S. W., forming what is known to the inhabitants as the "big bend," or "ox-bow" of the river, passing through Washington and Fulton to Maple Rapids.

I say healthful, because I am convinced of this by natural indications and the words of truthful individuals, who say that in an early day the waters of Maple river had equal freedom with the native red man, who could launch his canoe and traverse the whole distance from source to termination with no obstacle to impede his progress save an occasional fallen tree or sandbar. Then the fall in the river was sufficient and the channel of adequate capacity to carry off the water in the spring and fall, so that the retention of the water was of short duration in comparison with the present. Then the Indians, and a few white hunters that frequented the parts, would encamp and remain for months at a time in the worst localities with as much impunity as they would adjacent to other rivers passing through other sections of country. The bottom lands were covered with a healthy growth of vegetation inclusive of large quantities of ash, elm, and basswood timber. Decomposition of vegetable and minute animal life was not excessive, upon which depends the generation of miasma and poisonous gases; consequently the amount of sickness was no greater than in localities favorably situated. But when, in 1840, a few

conceived the idea as a rapid way of making money, of putting into practical operation a mill-dam (one of the most damnable inventions that the human brain is heir to), for the destruction of life, health, and valuable lands, at a place known as Rochester colony (again in 1845 at the village of Elsie; in 1852 still another at Maple Rapids), the whole aspect of affairs was changed.

After the completion of the first dam, the water was held back and overflowed the flats for two or three miles up the river, and as the warm weather came on the following season the inhabitants of Duplain and Ovid began to get their first genuine shake up from the effects of malaria.

At Elsie the same effect was noticeable, the overflow being confined to about a mile on account of there being a considerable fall a mile above the dam.

When the Maple Rapids dam was completed it caused the overflow of the bottom lands to the amount of 2,000 acres or more at low water, the water to back up for a distance of ten miles or more making a perfect wreck of a belt of land on either side of the river, of from one fourth to a mile in width, through the townships of Fulton and Washington. The river bed became completely filled with the filth and debris from above. These lands are now in a condition suggestive of filth in the broadest sense, vegetation being entirely destroyed by the saturated condition of the soil, the surface having the consistency of thick mush.

When the fall rains come on the lands more distant become overflowed, in which condition they remain until the following spring, when more water accumulates; and by the time that spring is well advanced and the solar heat of sufficient intensity to begin the slow process of evaporation, a vast extent of country adjacent to Maple river will be covered with water from a few inches to two feet deep, emulsified with the filth from the channel, that has been accumulating and decomposing for the past thirty years.

In high water the overflow has been estimated at from 6,000 to 8,000 acres of valuable land that is rendered for several months of each year unfit for use. That this condition of affairs did not exist prior to the building of the dam has been acknowledged by many who were cognizant to the fact. And yet there are men whose assertion cannot well be disputed who say that the same condition existed prior to the building of the dam. We find here as happens many times in courts of justice, men of equal standing as to truth and veracity, making statements that are diametrically opposed. Thus it becomes very difficult to decide without a doubt whether the dam was the primary cause or not. That this condition did not always exist, and that either art or some unknown natural cause obstructed the river we haven't a single doubt.

That there has been a better condition was proved by a survey of the river by competent parties wherein it was found that the fall in the river between Bridgeville and Maple Rapids was 8.66 feet.

We have still another unmistakable proof in the dead, decaying, and silent trunks of drowned forest trees. To think that this class of timber grew in that soil in its present semi-fluid condition, where even the mud-hen has to poise her pinions and give an occasional flap to keep her from sinking too deep for locomotion, would be unreasonable in the extreme.

The high water overflow is not confined to the townships of Fulton and Washington alone, but it overflows all the land adjacent to the river through Elba and a small quantity in Duplain. As the water recedes again it leaves the bayous and sink holes full to decompose and emit miasma in the most active form.

The banks on the east side of the river through Duplain are high, whilst on

the opposite side there is a corresponding belt of low, wet land. This condition of high banks with timber render us aid in arriving at correct conclusions that several severe epidemics can readily be traced to the condition of the land. Inhabitants that were exposed to the winds blowing over them were severely afflicted, whilst those that were protected by the high banks with timber were entirely exempted, or the severity of the disease noticeably mitigated. When we reach Gratiot county the banks are low upon both sides, with a wide expanse of flat land. The inhabitants of this section not only suffer from the emanations of the soil, which is of a rich vegetable mold to the depth of a foot or two, underlaid with a subsoil of hard clay. But all the wells are filled spring and fall with surface water, so they are compelled not only to breathe the breath of the vile monster, but to drink his broth for a number of months each year.

The "Big Bend" or "Ox Bow" of the river has special interest in these investigations. The east bank at this point is the divide between Maple river and the Saginaw valley. Bad river having its source but a short distance east of the bend in the river, consequently all the water that overflows at this point does not return to the mother stream but deluges a large extent of low land adjacent to Bad river, which is so sluggish that it takes weeks, and in extreme high water months, to rid itself from the infringement of Maple river, although they do not, for the last few years, suffer to that extent, since the channel has been cleaned and straightened, which carries the water off much quicker than in former years. Yet they do not fail to get their annual supply of water from the Maple. The south branch is the portion of Bad river considered in this connection. There is no doubt that quite a percentage of the sickness for several miles from the source of Bad river to Saginaw is attributable to the overflow of the Maple.

It is not my intention to dwell upon the possibility or the manner of removing this condition, which would be conducive to the general health, but rather to show, by a record of about three thousand cases under my own observation, and by statements from other reputable physicians of several thousand cases more, that the overflowed lands have been and are now a fruitful source of disease; that the miasma emitted therefrom during the summer and fall months causes a very large percentage of the sickness, and has a deleterious influence over all classes of diseases. The time during which these observations were made extends over a period of nine years, from the beginning of 1870 to 1879, at the village of Elsie. The time was characterized by several severe epidemics that occurred along the river, which will need a short history, that we may arrive at a correct estimate as to the effect the overflow had over the sickness. During the winter of 1869 and '70 the amount of snow-fall was considerably more than for an average winter, which was followed by a large amount of rain-fall during the month of March, which overflowed the flats to a great depth, covering land that in ordinary years was exempt. In some places the people had to go in boats or on fences from house to house; particularly was this the case from where the river enters Elba to the "Big Bend," and along Bad river. This wet season was followed by a very hot and dry summer, with very low water. Intermittent fever was very abundant early in the season. In August an epidemic of dysentery broke out along the river from Rochester Colony to Washington. The epidemic was general within a certain radius, being confined mostly to the east side of the river. In fact, where there were cases on the west side it was where the low, wet lands extended back for a considerable distance.

If we refer to a map we will find that the village of Elsie, although only a mile directly east of the mill-pond is out of the limit of this epidemic. Not a single case occurred, to my knowledge, in the village. This peculiarity is easily accounted for by the fact that as the wind prevailed for the most of the season from the southwest, the east bank of the river being high and nearly an entire section of heavy timber between the village and river on the south-west, the locality was entirely protected, whilst northeast from the pond the cases were numerous and severe, the winds having better access to this section. In Elba the limit extended over a wider extent, to correspond with the low lands. Along Bad river cases occurred for a distance of three miles from the Maple.

A very prominent feature of this epidemic (and of all subsequent epidemics of dysentery in this region) was the strong influence the malaria had over the disease. So well marked was this that where cases were treated with the ordinary course of treatment, the cases almost invariably died. But when large doses of quinine were given and continued through the disease, a fatal result seldom happened. The years 1871 and '72 were marked for the large amount of "fever and ague" in the early part of the season, followed by continued fevers late in the fall and winter, in Elba, of which there were 14 cases of genuine typhoid fever, a large number of typho-malarial and remittent fever. I attributed the cause of the genuine typhoid fever to the condition of the drinking water. In fact, all these cases occurred without a single exception in localities where the wells were planked up, and had been filled for months with surface water, the houses being mostly poor, with small excavations underneath, filled with decomposing matter, the typho-malarial and remittent cases occurring in localities where the conditions were better. The severity of the diseases seemed to be governed by location.

In 1873, the amount of sickness was small, not very severe, and mostly malarial.

1874 and '75 were years of high water, and almost a counterpart of the years 1871 and 1872, with the exception that the sickness extended into Duplain, where it was hard to trace the fevers to a cause, as they occurred where the banks were high, and the people living in a prosperous condition; the wells and cellars were good. But the sickness seemed to be dependent on the river in some way, as it closely followed its course.

In 1876 and '77, of the fevers, the greater portion was in Elba, mostly near the source of Bad river. They were attributable largely to the condition of the wells and cellars.

During 1878, my last year in Elsie, the sickness was more general, did not seem to follow the river as closely as in years before, the typhoid and typho-malarial fevers being confined to Duplain, in the vicinity of Elsie and west of the river.

According to my observations, all forms of diseases, both sthenic and asthenic, were affected badly by the malaria, the result of the overflow of Maple river. Pneumonia, rheumatism, neuralgia, etc., were always worse in type than in other localities. Consumptives, and all cachectic patients succumb sooner than in localities more favorable situated.

To aid in forming a correct estimate of the amount of influence the overflowed lands have on the public health, I submit replies from several reputable physicians, to interrogatories sent them by myself concerning this matter; also a table giving the whole number of cases treated by me in each year, the diseases that were most conspicuous in prevalence, and the per cent of cases that were caused and affected by malaria, in the townships of Duplain and Elba.

TABLE.—*Showing the number of Cases of certain diseases treated by myself in the Years 1870–8, within two miles each side of the Maple River; also the per cent affected by malaria, and the number of Severe cases caused by malaria.*

Year.	Number of Cases treated within two miles each side of the river.	Diseases that were most conspicuous for the Year, as to severity, etc.	Per cent of Cases caused and influenced by malaria.	Number of Cases that were severe.
1870......	212	Dysentery......	80	142
1871......	287	Typho-Malarial Fever, Dysentery, Ague......	80	47
1872......	471	Malarial fevers......	82	23
1873......	326	Everything......	70	17
1874......	372	Typho-Malarial fever......	65	14
1875......	402	Typho-malarial and Typhoid fevers......	55	27
1876......	210	Malarial-Typhoid fevers......	62	8
1877......	289	Diarrhea......	40	123
1878......	401	Remittent, Typhoid, Typho-Malarial fevers......	52	31
Nine years.	2,970	......	65	432

QUESTIONS SENT TO PHYSICIANS.

1. How many cases have you treated yearly adjacent to Maple River for a distance of two miles each way, and the number of years?

2. What percentage of cases were caused wholly or in part by the decomposition of animal and vegetable substances, the result of the overflowed lands adjacent to Maple River.

3. What percentage more of cases along the river were affected than for an equal amount of country at a distance?

4. What can you say as to epidemics in this region?

REPLIES BY E. V. CHASE, M. D., OF ELSIE.

1. The aggregate number of cases I have treated yearly is about 300 for a period of 24 years.

2. From the years 1857 to '60 about 90 per cent, and the other 10 per cent was more or less influenced. Since that time until the present the decay of vegetable and animal substances has a direct influence over about 25 per cent of the cases during that time.

3. The dysentery that appeared along the banks of the river in 1870 and '71 was at the time supposed to be caused from the effects of a poisoned atmosphere caused from the low water in river and wells. The typho-malarial fever that followed was caused from the impurity of back-yards to dwellings, rather than the effects of malaria. Very truly,

Elsie, April 1, 1882. E. V. CHASE, M. D.

REPLIES BY H. HART, M. D., OF EUREKA.

1. About 300 cases each year for the last four years, through Elba to Bridgeville.

2. About two-thirds in the years of 1879–80–81. In the last year there has been a good deal of mixed fevers, typho-malarial, tedious to handle, with a good percentage of losses.

3. One-half or more.

Eureka, April 7, 1882. H. HART, M. D.

REPLIES BY S. M. POST, M, D., OF EUREKA.

1. About 2,500 in the last eleven years.

2. About two-thirds of them have been malarial diseases, and most of the others were more or less influenced by malaria.

3. There were about fifty per cent more cases influenced by malaria in proportion to the whole number along the river than those further away.

4. Every two or three years there have been epidemics of different kinds, which were worse on the low ground contiguous to the river, or wherever surface water was allowed to mingle with the well-water. Last year there was a run of typho-malarial fever, which only prevailed along the river, and in the country which would be drained by the dredging of said river. The places away from the river where it prevailed were where the wells were boarded up, and about six to ten feet

deep, filled with swamp water from swamps that would drain into Maple river, which overflows thousands of acres of land every spring, and as the water subsides leaves a fearful stench from decaying animal and vegetable matter.

Eureka, April 8, 1882. S. M. POST, M. D.

REPLIES BY DR. L. W. FASQUELLE, OF ST. JOHNS.

In my opinion, the following cases of sickness treated by me were all of malarial origin, from the year 1855 to 1881 inclusive, along the line of Maple river.

YEAR.	DISEASES.	CASES.	DISEASES.	CASES.
1855	Continued Fevers.....	30	Dysentery.............	10
1856	" "	42	"	26
1857	" "	39	"	12
1858	" "	20	"	26
1859	" "	28	"	18
1860	" "	32	"	40
1861	" "	42	"	10
1862	" "	34	"	
1863	" "	28	"	
1864	" "	31	"	
1865	" "	28	"	10
1866	" "	*48	"	14
1867	" "	32	"	18
1868	" "	33	"	46
1869	" "	†40	"	26
1870	" "	28	"	18
1871	" "	18	"	10
1872	" "	14	Epidemic of Dysentery at Rochester Colony, within 4 miles along the river.............	140
1873	" "	22		
1874	" "	22		
1875	" "	12		
1876	" "	14		
1877	" "	13		
1878	" "	10		
1879	" "	16		
1880	" "	13		
1881	" "	12		
27 yrs.		701		426

* Epidemic of typhoid fever at Shepardsville.
† Epidemic of typhoid fever on county line and at Shepardsville.

Within the last five years the mill-dam has been removed at Rochester Colony; since that time the malarial diseases have decreased to a great extent along Maple river in that section, there being now no more malarial diseases near the river than at a distance of six or eight miles from it. Along the line of Maple river for a distance of ten miles east of Maple Rapids, the decrease in malarial diseases has not been so great as near Rochester Colony since the dam was removed at the latter place, but as other physicians have settled along the river at two or three points and I have not attended the cases in that section as much as I used to, I cannot say so much about them.

St. Johns, Michigan, April 10, 1882. LOUIS W. FASQUELLE, M. D.

By reference to the table, page 188, we find the per cent of cases influenced by malarial fever from 1874 to 1878 to vary from 65 per cent to 40 per cent, much less than in former years. This reduction was due in part to the general improvment of the country and partly to the improvement of Bad river about this time, so that a large amount of intermittent fever was eradicated in the region of the "Big Bend" of the river. Yet we find an average per cent of cases affected by malaria of 65 per cent for a period of nine years.

By a careful comparison of these figures with those for a section of country of equal extent, situated away from the river, the amount of sickness away from the river was found to be very much less, and only about 20 per cent of the cases there were influenced by malaria. Deducting the 20 per cent, as being the natural condition, from the 65 per cent where affected by the river, we still have 45 per cent of the sickness caused or affected by the overflowed lands ad acent to Maple River.

S. E. GILLAM.

DISCUSSION.

The discussion of this paper was opened by Dr. Avery of Greenville. He said he had been acquainted with the river for the past 35 years; had paddled the whole length of it in a canoe in early times, when the trees on the banks were alive and green. Since the flooding they are dead and much decaying debris is in their place, and there are 3,000 to 5,000 acres of land overflowed. He had been sent by the State Board of Health to investigate the matter. It is claimed that the devious channel and dead level of the river would not drain these lands if the dams should be removed. This is not true. From Bridgeville to Maple Rapids, a distance of fifteen miles, there are 8.66 feet fall. This is amply sufficient to drain every acre of these flooded lands; we should then have 5,000 acres of arable land where now we have only so many acres of miasmatic swamps, and could thus sensibly decrease the amount of sickness.

Dr. Corbin of St. Johns said he had lived in that locality 20 years and agreed in the main with the views expressed by Dr. Gillam, but thought the deductions were not absolutely correct. He had noticed that at the time when malaria was so prevalent about Maple river, that section of the country remote from the river suffered in like manner. In his own practice he had attributed it to the exposure of decaying organic matter in the clearing up of the land.

The next paper was on "Vaccination: Jenner *versus* Bergh," by C. M. Martin, M. D. It is as follows:

VACCINATION: JENNER vs. BERGH.

BY C. M. MARTIN, M. D., OF GREENVILLE, MICH.

The lively interest so many members of the medical profession take in these sanitary conventions shows that physicians do not believe their whole duty done, by confining their work to the bedside of the sick.

To teach the people how to keep well, to caution them against the baneful practice of resorting to drugs for every slight ailment, and to enlighten them in regard to all known safeguards against disease, are now regarded as very important duties by all advanced physicians.

People are very liable to disregard the laws of health, and to neglect even known safeguards, unless frequently reminded of the danger they incur by such neglect.

The recent epidemic of small-pox in this country has served one purpose at least, viz.: that of arousing them from their apathy in regard to the necessity of vaccination. But they are yet far from being aroused to a full sense of their danger, and it is high time that physicians should educate the people in regard to a matter of such vital concern.

To read the current literature of the day one might suppose that vaccination was still on trial, that the claim of its protective influence against small-pox was a matter of doubt, and was yet to be established. A few in all countries,

and the number would seem to be on the increase, vigorously maintain that vaccination is a delusion and a curse. These must be met and answered by the logic of facts, before they have done irreparable mischief by creating prejudices which it will be hard to overcome. Vaccination does not rest upon theory. It rests upon a solid foundation of facts and figures, which have been accumulating for nearly a century.

In this paper I do not claim any originality. It is simply a collection of facts and figures from sources of undoubted reliability. If I shall be able to attract thoughtful attention to these facts, and disabuse the minds of some who may have doubts of the efficacy of vaccination, I shall deem that one important duty I owe as a physician to the community has been performed.

The year 1776 is not only memorable as the year in which the Declaration of American Independence was made, but also memorable as the year in which the germ of emancipation from the thralldom of small-pox took root in the mind of man.

A young medical student, named Edward Jenner, during this year commenced an investigation into the nature of small-pox, and means for its prevention, which resulted in a discovery that will link his name for all time with the great names of the earth.

While in his preceptor's office a young countrywoman came there for advice. During her stay the subject of small-pox was incidentally spoken of, when she remarked, "I cannot take small-pox because I have had cow-pox." She little thought what an effect these few words were destined to have upon mankind throughout all the ages to come.

The penetrating mind of young Jenner was strongly impressed with the remark. He found it a common belief that those who had once had cowpox were as completely protected against small-pox, as they would be from a second attack of that disease, having passed successfully through the first. Now, he thought, if it can be proved that an attack of the mild and harmless disease, cow-pox, will protect the system against the loathsome and deadly disease, small-pox, then it is a very desirable thing to have cow-pox.

For more than twenty years he pursued his investigations, nothing daunted by the ridicule the profession heaped upon his chimerical idea. He first learned that cow-pox was a veritable disease, "manifesting its presence externally by sores upon the udders of the cows affected by it, and that milkers were apt to contract the disease." Upon extensive research he found the popular belief in the protective power of cow-pox against variola, was no silly superstition, but was a fact, and it did indeed exempt from an attack of that dreadful disease.

On the 14th of May, 1796, he performed his first vaccination on James Phipp, with cow-pox virus, and to his intense delight it took, the various stages of the cow-pox eruption occurred, regularly and perfectly. His long-cherished hopes were realized. He had proved that the harmless disease of cow-pox could be artificially communicated, and henceforth not only dairymaids who were fortunate enough to get the disease could enjoy immunity from small-pox, but all persons by a simple operation might have conferred upon them exemption from one of the greatest scourges of the earth. Men were slow to accept such an apparently preposterous idea. Finally in 1799, seventy of the most distinguished physicians and surgeons of London signed a declaration of their entire confidence in the discovery. The horrors of this disease and its terrible destruction of human life were so familiar to the people of that day,

they realized to its full extent the magnitude of the blessing the discovery brought to them.

In our time, with small-pox circumscribed and shorn to a large extent of its power by vaccination, we cannot fully enter into the feelings of the people of that generation. Everywhere the discovery was hailed with joy and gratitude. Honors and money poured in upon the man who had chained the monster, small-pox. He was made a member of most of the learned societies of the world, and grants of money voted him by the British Parliament aggregating one hundred and fifty thousand dollars.

By his discovery he established the following facts: 1, That cow-pox can be artificially communicated to man; 2, That the person who has had cow-pox is protected from small-pox; 3, That vaccinia, or cow-pox, may be transmitted from person to person without impairing, to any great extent its protective power. The precise way it impresses the system to fortify it against small-pox is a problem which remains to be solved. It is believed that some of the constituents of the blood are so altered or destroyed that if the poison of small-pox be introduced into the system, it will not find there the conditions and elements necessary to the development of that disease.

It is not claimed that vaccination invariably preserves the system from an attack of small-pox. One attack of variola itself does not protect absolutely from future attacks. It is not, therefore, extraordinary that vaccination does not. Instances are recorded where the same person has had variolus eruption several times. In one case the patient was attacked six times with small-pox and escaped with his life, but died from the seventh invasion of the disease.

Although vaccination is sometimes powerless to prevent the disease, it is established beyond the shadow of a doubt, that it always diminishes the gravity of the malady. That it always renders the disease comparatively harmless is proved by evidence that it is sheer folly to try to discredit.

For many years vaccination was almost universally accepted as a complete protection against small-pox. Recently some German writers have bitterly assailed it. The cry has been taken up by a few Englishmen of little reputation in the scientific world, and very lately, violent opposition to it has broken out here and there in this country.

The most prominent and influential of these persons, perhaps, is Mr. Henry Bergh, who is so widely known and esteemed for his humane efforts to prevent cruelty to animals. In the February number of the North American Review, he launches a diatribe against the practice of vaccination. Coming from so distinguished a source, the article has attracted wide attention. In this article Mr. Bergh characterizes vaccination as a "hideous monstrosity," and he makes the ridiculous assertion that he proposes to prove that vaccination never has and never can afford immunity from small-pox. In his intemperate zeal to overthrow vaccination he further asserts that it does not even mitigate the malady.

Such wild statements as these are the surest antidotes to the pernicious teachings he would inculcate, and are calculated to excite only pity and contempt for the ignorance they evince of a subject of which he speaks with so much assumed authority.

Dr. Henry Austin Martin, who stands at the head of authorities in this country on the subject of vaccination, says, in the April number of the North American Review, that Mr. Bergh's study of the literature of vaccination is apparently limited to the fifteen-page pamphlet of a wildly visionary theorist,

and a four-page London libel of Dr. Henry A. Martin, of which Mr. Bergh's paper in the February number of the North American is little more than a reprint without acknowledgement.

Mr. Bergh, in his article, presents some statistics which seem to militate against vaccination; but when they are set over against the great mass of evidence in its favor they appear as only a mole-hill compared to a mountain. The evidences of its protective power are almost inexhaustible, the recital of which would fill volumes. I can only select a few of the most striking and conclusive:

An epidemic of small-pox occurred in India in 1878, which carried off 58,800 of the natives in a single year. The superstitious natives resisted all attempts to introduce vaccination. They regarded the disease as a visitation from Deity, who was thus showing His displeasure with them.

The Thakers, a tribe which practiced infanticide, finally allowed the female children to be vaccinated, believing and hoping that the operation would result in the death of the child, this method being regarded a convenient way to get rid of their superabundant offspring. The sons, however, were not permitted to undergo so dangerous an operation. Small-pox broke out among them a short time afterward, and destroyed nearly all the unprotected boys, while the vaccinated girls escaped. Then the surprised natives reversed the process and compelled the boys to be vaccinated, and left the girls to their fate. Some hid their children from the vaccinators, and most all these children who were hidden away took the disease and died.

In Sweden, before the introduction of vaccination, the average annual number of deaths from smallpox was 1,973 in a million. After its introduction, but was made optional, the number fell to 479 per million. When vaccination was made compulsory, the average number fell to 180 per million. Dr. Welch, in charge of a hospital in Philadelphia, says: "In the last twelve months I have had under my care 1,200 cases of small-pox, and of this number only *one* had been recently vaccinated, and he recovered."

During the Franco-Prussian war, when the German army was double the strength of the French, there were only 263 deaths from small-pox in the entire army; this surprising exhibit being due to the fact that all German soldiers on entering the service must be revaccinated; while in the French army, where vaccination is not compulsory, the loss from the disease reached the enormous total of 23,368.

Dr. Atlee, of Pennsylvania, gives some personal experience that should convince the most skeptical. He says: I have tested the efficacy of vaccination by inoculating for small-pox after vaccination. I have taken patients after vaccination to cases of malignant small-pox in small and hot stove rooms, and exposed them for 15 or 20 minutes, secure from danger. In one case a mother with six unvaccinated children, one a nursing babe, had an attack of small-pox. As soon as I discovered the nature of the disease I vaccinated all the children, and they all took. The room was a small 10x12 feet room, with but one bed, on which they all slept, which of course was saturated with contagion. Yet these children picked the scabs from the mother's body, the baby was nursed by its mother, and not one took the disease.

In one of the worst epidemics that has occurred since the discovery of vaccination—that of Marseilles, France, in 1828—more than 10,000 persons were attacked. Of these 2,000 persons had been vaccinated, of which number only

45 died, or 1 in 44, while of the 8,000 unvaccinated over 1,500 were carried off, or 1 in 5.

Dr. Buchanan, in the office of the British Government Board of Health, furnishes statistics which show the death-rate among vaccinated adult persons to be only 90 in a million, while among the unvaccinated it is 3,350 per million.

The necessity of revaccination is now fully established.

In Germany it has been practiced on a very extended scale, with the effect to completely arrest the epidemics that were becoming quite frequent in that country. In Wurtemburg, where 42,000 persons were revaccinated, the whole number presented only eight cases of mild small-pox, or varioloid, whereas prior to this revaccination one-third of the cases of small-pox had occurred in persons who had been vaccinated.

It may be affirmed that revaccination is the only safe and sure test of a successful vaccination, since if it does not take the second time it is proof that the person was protected by a preceding vaccination. Ziemssen's Cyclopedia of Medicine sums up the matter by saying that, in general, the immunity vaccination secures from small-pox may be put at from eight to twelve years. "In order to maintain a state of perfect immunity after this period a revaccination is required, and should be repeated at the expiration of the above mentioned period throughout the remainder of life."

Dr. Henry Tompkins, Medical Superintendent of the Fever Hospital belonging to the Manchester Royal Infirmary, says: "The most striking of all evidence is, perhaps, that derived from the small-pox hospitals themselves. At Highgate during an experience of 40 years, no nurse or servant having been revaccinated has ever contracted the disease; and during the time I have had charge of the Fever hospital more than 1,000 cases have passed under my care, yet no nurse, servant, or other person engaged there has, after revaccination, ever taken it, though exposed daily to infection in its most concentrated form. Again, among all the students for the last two years who have attended the hospital for clinical instruction, not one has suffered, all having been revaccinated before being permitted to enter the small-pox ward."

He adds: "I defy the most enthusiastic or conscientious anti-vaccinationist to produce evidence like this on his side of the question, or to bring forward even half a dozen persons, choose them whence he may, who have not been protected against small-pox, and expose them as the students are exposed, without more or less of the number taking the disease." And yet there are those who will not be convinced.

In consequence of the aggressive action of the Belgian League of Anti-vaccinationists, the Belgian Academy of Medicine appointed a committee to examine this question anew in all its bearings. The report of this committee was briefly: 1, That without vaccination hygienic measures, whether public or private, are powerless to preserve mankind from small-pox. 2. The belief in the danger of vaccinating and revaccinating during the presence of a variolus epidemic is not justified. 3. We can no more cultivate small-pox by sowing cow-pox than we can barley by sowing wheat. 4. Vaccination is always an inoffensive operation when practiced with proper care on healthy subjects. It gives rise to fewer and less serious accidents than simple piercing of the ears. 5. It is highly desirable in the interest of the health and lives of our citizens that it be made compulsory.

Owing to the violent opposition of the Anti-vaccinationists of London, the

National Health Society issued 20,000 pamphlets with similar information, in which it is stated that before the discovery of vaccination, statistics show that the mortality was forty times greater than it is now.

All reliable evidence of the value of vaccination is of the same import, and yet Mr. Bergh has the hardihood to assert that it affords no protection against small-pox, and does not even mitigate the malady!

He not only denies that it has any protective influence, but affirms, to quote his own language, "That millions upon millions have been inoculated with the most loathsome pestilence, doomed to carry to the grave bodies wasted by consumption, or defaced by scrofula, cancer, and innumerable ills." In the excess of his zeal to leave no ground for the vaccinationist to stand upon, he declares that the virus direct from the heifer is filthy and dangerous, for the reason that a certain percentage of cows are affected with tuberculosis. He is not content to stop here, but goes out of his way to publish his opinion that milk is unwholesome, and the most likely of all human foods to introduce disease germs into the system. So that we may infer from this "wise man of Gotham," that while millions upon millions have become diseased by vaccination, they are but few compared with the almost countless millions that have suffered and died from the time Jacob tended his herds, down to the present, from the effects of tuberculosis induced by drinking milk! Added to this the fact that for untold generations the human race has not only eaten the milk but the flesh of these animals we may well stand aghast at the appalling danger it suggests.

Butter is another article which, according to Mr. Bergh, must be put in the category of disease-producing food. If Mr. Bergh is correct, what better is genuine butter than the counterfeit article, so far as propagating disease by its use is concerned? The idea is commended to the attention of manufacturers of oleomargarine, with the suggestion that Mr. Bergh would make an excellent traveling salesman for their wares. Who shall say that the universal use of milk in all ages may not possibly account for the deterioration of the race and for the decline of the average length of human life from the time of Methusaleh down to the present! Mr. Bergh should now launch his thunderbolts against the disease-producing custom, which, according to his views, must be one of the most potent causes of consumption, which in our time claims more victims than any other disease. Having secured reform in this direction, and demolished Jenner's pretensions, he will take his place as a star of the first magnitude in the firmament of great discoverers and great benefactors of mankind.

We will now leave the pseudo-scientist, Mr. Bergh, to consult a man who knows what he is talking about, Dr. Henry Austin Martin, who has devoted twenty-five years of his life to the study of vaccination, and made a specialty of propagating and supplying to the profession the best attainable vaccine virus. He says: "I have devoted quite exceptional attention to the practice of vaccination, having in one year made nearly 11,000 vaccinations. Thousands of infants that I have vaccinated have grown to adult age. And as a result of this exceptional opportunity to form a deliberate and accurate opinion of vaccination, I wish to say, with as much solemn earnestness as if it were my last earthly utterance, that I have never known among those whom I vaccinated a single case of small-pox in any form or modification, except a limited number into whose systems the germ of the disease had entered before the time of vaccination, making itself evident within fourteen days after the

operation." He adds: "I have never seen or suspected in my own practice one such case as Mr. Bergh asserts to exist by millions. I have never had a patient die in any way that could be directly or indirectly ascribed to vaccination. Nor have I had the slightest reason to suspect that vaccination had impaired or deteriorated human vitality." He further says: "I have never seen a case of vaccinal syphilis, though convinced from reading that such cases have occurred. I have seen many cases of vaccinal erysipelas, but all recovered, and not a single case of this disease has followed or complicated the use of true animal virus."

Leaving the physician's standpoint, we may profitably look at this question from other points of view. Take the great business of life insurance, the success of which so much depends upon maintaining a high average length of life. Notice the great value the unrivaled statisticians of these great institutions place on the discovery of Jenner. Do these companies ask of the person desiring insurance the question, "Have you successfully avoided the contaminating and poisonous operation of vaccination?" No. "Have you been successfully vaccinated?" is the question asked by the medical examiner of the applicant for insurance, a negative answer being considered sufficient reason to render him an unsafe risk. Take the armies of the world, especially that of Germany, where the soldiers are models of vigor and strength, despite the fact that vaccination and revaccination are enforced with the utmost care. The haste with which physicians resort to revaccination of themselves and families during an epidemic, if any doubt exists in their minds of perfect safety, gives proof of their confidence in the operation, and their disregard and disbelief in the ravings of the fanatics who oppose it. Dr. Martin, in his article in the April North American Review, says "that the leaders of Anti-vaccination, almost to a man or woman, are very thoroughly vaccinated."

It must not be forgotten that it is not claimed in this paper that serious consequences may not sometimes follow vaccination. Evidence of this has come within the knowledge of nearly every person of adult years; but compared with the whole number vaccinated, the cases attended by bad results are exceedingly few. Concerning the charge of Mr. Bergh that tuberculosis and scrofula may be transmitted by vaccine lymph, there is not the slightest evidence to support it. In only one disease, and that is syphilis, has the possibility of its transmission by vaccination been demonstrated, and these cases are so exceedingly rare as to have little weight as objections to vaccination. Even these rare occurrences are not the fault of vaccination, but of its improper performance. Perfect safety against accidents of this kind may be secured by using lymph direct from the cow. If people would insist that their physician should use no other, means would be found to supply the market with all the bovine or animal virus that would be required.

Let no one be deterred then, from the benefits of vaccination by the bugbears set up by Bergh and his coadjutors.

A man reads in the morning papers of the death of several persons by a railroad accident, yet he steps aboard a train bound for a distant city with almost perfect confidence that he will reach his destination. His liability to be killed on that journey is vastly greater than that any harm will result to him from vaccination.

From the foregoing evidence it appears: 1. That successful vaccination protects from small-pox. 2. That almost absolute protection may be secured

by revaccination once in 8 to 12 years. 3. That the operation is a trivial one, and devoid of danger in the vast majority of cases.

In view of these facts it follows that it is the right and duty of the State to enforce vaccination. It claims the service, and if need be the lives of its citizens, when good order and the welfare of its subjects are in danger from a foreign or domestic foe. So when the destroyer, small-pox, invades the land it can be regarded as only the most trifling surrender of personal rights that is involved in compulsory vaccination, as a means to hold at bay an enemy "more terrible than an army with banners."

Dr. Joseph Edwards, in his admirable little book on vaccination, to which I am indebted for many of these statistics, proposes a plan of legislation that seems admirably adapted to secure the end in view.

He suggests the creation of a State board of vaccination, which should be given authority to compel the vaccination of every man, woman, and child in the State. The board should establish a State vaccine farm. The State should be divided into vaccine districts. A vaccine physician should be elected by the State board, whose duty it should be to vaccinate every person in his district. By this plan the district physician should be supplied with vaccine virus direct from the State farm free of cost. The vaccine physician should be required to keep careful and complete records of all cases vaccinated, and should make monthly reports to the superintendent of the farm, who should be a physician, and he in turn should make an annual statistical report to the State board.

Dr. Edwards would make vaccination compulsory once in five years, with a severe penalty for any one who neglected it.

By this plan the people would have assurance that only pure virus was being used, and that the operation was performed by a competent and careful physician. He would have all these officers paid by the State, and no charge for vaccination, so that no one could have excuse of "want of means" to offer for failure to comply with the law. I might add that this provision would remove the suspicion that some people entertain, viz.: that the doctor advocates vaccination for the fee it brings to him.

This means universal vaccination, and if carefully carried out would render small-pox a thing of the past.

It is to be hoped that the recent epidemic of this scourge may result in stirring up the people to more vigorous and thorough treatment of the whole matter, and have the wholesome effect to make us all properly appreciate and use vaccination for all it is worth, in the interest of humanity.

DISCUSSION.

In the discussion of this paper, Bishop Gillespie spoke of the necessity of purity of the vaccine matter, and inquired as to the desirability of State interference to settle the matter and make vaccination compulsory.

Dr. Baker hoped the State would not try to compel vaccination. The effect would be to arouse opposition, as in England, where they have a compulsory law, and also an Anti-vaccination league. To force people against their will to be vaccinated, he thought unjust. Such a law would be a dead letter from the start, and he was in favor of endeavoring to reach the end sought by enlightenment and persuasion. He said he was not in favor of a State farm to furnish vaccine matter, because it would compete with competent and honest propagators of virus who have made the business a specialty.

[An account of a presentation of the subjects of compulsory vaccination, State vaccine agent etc., which occurred at the Sanitary Convention at Ann Arbor, may be seen on pages 31-2, and 36-7, of this volume. While there is among sanitarians a difference of opinion on the question in social science as to the desirability of having a law for compulsory vaccination, there is among them no

difference of opinion as to the desirability of having thorough and universal vaccination. Every prominent sanitarian in this country favors this, and no incidental discussion of compulsory vaccination should be permitted to detract from the main thoughts in the papers by Dr. Wight and by Dr. Martin.—H. B. B., Sec. S. B. of H.]

The next paper was on "High Pressure *versus* Hygiene in our Public Schools," by Rev. M. W. Fairfield, of Muskegon. It is as follows:

HIGH PRESSURE vs. HYGIENE IN OUR PUBLIC SCHOOLS.

BY REV. M. W. FAIRFIELD OF MUSKEGON.

The frequent failure of the health of pupils in our public schools, and especially in the higher departments, has been a matter of common observation and remark; and the marked increase, in late years, in the number of such cases, and the variety of diseases occasioning this failure of health, has justly begun to awaken serious solicitude on the part of parents and educators.

It certainly is true, and the statement will hardly be questioned, that the health of pupils in our high schools is not, on the average, up to the standard of former years. There are now more cases of disability, and more cases of an utter breaking down of health. Various diseases, impairing the vital forces, have multiplied among advanced pupils. Some of these diseases can easily be directly traced, certainly in their aggravated forms, to the school as at present conducted.

It was formerly a rare thing for pupils to be obliged, on account of health, to give up school life. Now it is so common that quite a percentage is expected to be unable to complete the ordinary high school course.

Noticeably among these physical disabilities is the impairing of the sight. It is a painfully common thing to see weak eyes among the older pupils, and glasses are becoming almost as common among advanced scholars in our public schools as among old people. You can hardly go into any high school without seeing beardless boys and young misses wearing their glasses, and in many cases colored glasses. In one of the high schools of this state, a school having a first class standing, the principal informed me, a year or two since, that about nine per cent of the pupils were constantly suffering from impaired vision.

The conceded increase of various kinds and degrees of disease among our youth in the public schools, demands rigid investigation, that, if possible, the cause or causes of such increase may be discovered and removed.

The general and marked characteristic of these disabilities among the higher pupils is of a nervous nature, more or less impoverishment of the nervous energy. This fact may put us upon the track leading to the discovery of the prevailing causes. Following out this hint, What seem to be some of the main causes of this alarming increase of physical infirmities, particularly among our advanced pupils in the public schools? I say causes, rather than cause; for I think it is safe to assume that several causes may be found which contribute to the one disastrous result.

BAD VENTILATION.

Doubtless bad ventilation is a most fruitful cause of this impaired health. This bad ventilation begins its work in the primary room, and continues it

through all grades, till finally, in the latter years of the course, the vital forces of many are so far reduced that the school must be abandoned.

All forms of nervous disease are fostered and developed by foul air, imperfect ventilation. The only wonder is that our children stand the foul atmosphere of the average school-room as long as they do before succumbing. The appeal of the people to the old church "sextant," needs to be made by the pupils to the school-house "sextant." With slight alteration that appeal meets the case exactly:

"Oh, sextant of the school-house, which sweeps
And dusts, or is supposed too! and makes fires,
* * * * * * *
O, sextant! there are 1 kermoddity
Worth more than gold, which doesn't cost nothink—
Worth more than anythink except the sole of mann:—
I meen pewer are, sextant; I meen pewer are!
O, it is plenty out o' doors, so plenty it doan't no
What on airth to do with itself, but flies about
Scatterin' leaves, and blowin' off men's hatts;
In short, it's "jest as free as are" out dores.
But O, Sextant, in our school-house it's as scarce as hen teeth—
Scarce as bank bills in churches when agints beg for missions,
Wich some say is purty often (tain't nothin' to mee;
Wot I give ain't nothin to nobody); but O, Sextant,
U shet 100 girls and boys,
Speshaly the latter, up in a tite place,—
Sum has bad breths, none ain't 2 swete,
Sum is fevery, sum is scroflous, sum has bad teath, and sum ain't over cleen;
But every 1 of em brethes in and out, & out & in,
Say 50 times a minit, or one million & a half breths an our;
Now how long will a school-house ful of are last at that rate,
I ask you? Say 15 minits, and then wots to be did?
Why then they mus brethe it all over agin,
And then agin, and so on til each has took it down
At least 10 times, and let it up agin. And wot's more
The same individdible doan't have the privilege
Of breathin his own are & no one's else;
Each one must take whatever comes to him.
O, Sextant, doan't you know our lunks is bellusses,
To blo the fire of life and keep it from
Going out; & how can bellusses blo without wind?
And ain't wind Are? I put it to your conshuns.
Are is same to us as milk to babies,
Or water is to fish, or pendlums to clox,
Or roots and airbs unto a injun doctor,
Or little pills unto a omepath.
Or boys to girls. Are is for us to breeth.
Wot signifies who teaches if I can't breethe?
What's Profs. & Profeses to children who are ded?
Ded for want of breth? Why, Sextant, when we dye,
It's only coz we can't breathe no more—that's all.
And now, O Sextant, let me beg of you
2 let a little are inter our school-house.
It ain't much trouble—only make a hoal,
And all the are will cum of itself.
It luves to cum in where it can git warm,
And O how it will rouse the childers up,
And sperit up the teacher, and stop gapes
And yawns & fijits, as effectual
As wind on the dry Boans the Profit talks of."

Give us, therefore, better ventilation in our school-houses.

HIGH BUILDINGS.

Another cause of impaired health in our high schools, especially with certain classes of pupils, is no doubt to be laid at the door of the architect and building-committee. Our high-school buildings are too high—have too many stories; and the higher stories are usually appropriated to the higher departments, which only aggravates the mischief. The opinion of our ablest physicians, who have given the subject attention, is a unit on this point; and not only a unit, but emphatic. No school-house ought to be more than two stories high, if our doctors are not all and utterly at fault in their views.

The same mischief comes of placing the school-house on the top of the highest hill in or about the town, if the town has a hill. In one of our towns in this section of the State the school-house is located on a hill that is higher than the tops of all the houses, and even all the church spires, every pupil being under the necessity of climbing a hill more than 100 feet above the level of the village. I suppose that the old New England idea in reference to locating the meeting-house, must govern in such cases the school board, of having the house as near heaven as possible, so as to receive the selectest influences at first hand! The motive is to be greatly respected, but the wisdom of the plan is to be suspected. All honor to the educational board of Kalamazoo for establishing it as a rule in that village that no school-house there shall be above two stories.

BAD ADJUSTMENT

of light is unquestionably another fruitful cause of bad health in our public schools, especially in the matter of the eyes. This is a point to which no sufficient attention has yet been directed in this country. In Europe, and especially in Germany, this subject has long been specially looked after and provided for.

Most of our school-rooms have windows on both sides of the room; and the pupils are compelled to use crosslights, which is always more or less confusing to the eye, and always puts a strain upon the organs of vision, and will eventually seriously damage the eyes of considerable numbers. Germany has long since, I am told, forbidden by law the construction of school-rooms in this way.

Then, too, in a large number of our recitation-rooms the pupils face the light. It is a very common thing in such rooms for the black-board to be between two windows! It would sometimes seem as if school boards had deliberately planned to weaken the eyesight of all the pupils. Certainly the criminal carelessness or ignorance or both in this adjustment of light is almost unpardonable,—certainly inexcusable.

HIGH-PRESSURE.

But while these three causes, and doubtless others that could be named, have contributed largely to lowering the tone of health among the pupils in our public schools, there is, in my judgment, another cause quite as potent as either of these, or, perhaps I am not stating the matter too strongly if I should say, as potent as all of these combined, in operating unfavorably, even disastrously, upon the health of the scholars in the advanced departments of our public schools. I refer to the high-pressure system of study which so generally prevails in these departments.

I do not hesitate to express the opinion,—an opinion not hastily formed,

but formed from considerable observation and inquiry,—that the amount of study demanded of pupils in the high-school is altogether beyond the just limit set by the laws of health,—health of body, mind, and morals.

Doubtless there is no absolute uniformity of demand in all high-schools. But, so far as my observation and inquiries have extended, there are very few high schools which do not carry the demand up to the high-pressure point.

Just look at the case: four solid studies are pursued simultaneously and daily, requiring of the average student not less than two hours of preparation for each study; and these four studies are sandwiched and spiced with sundry other lighter studies and general exercises, such as essays and declamations and music and writing, etc.

Thus the daily demand is for eight or ten hours—say an average of nine hours—of solid study, beside four hours of recitations, making in all thirteen hours daily of solid brain-work! and this for pupils in the growing period of their physical powers! We complain of eleven or even ten hours daily of muscular labor, exacted of the brawny and toughened laborer; but of growing youth, in the mere gristle, we demand thirteen hours of more exacting and exhausting brainwork!

Is it any wonder that the physical system, and especially the nervous system, whose headquarters are the brain, should give way under such an exorbitant demand, and such prolonged strain? The mere statement of the case is its condemnation.

Why, in our colleges, where our young people are supposed to have become somewhat consolidated in their physical powers, the utmost demanded is three hours' recitation, with the expected six hours of preparation, making in all nine or ten hours as over against the thirteen required in the high school!

Not only is the nervous system over-taxed and over-strained by this exacting, exhaustive, and high-pressure system; but the mental forces are weakened instead of strengthened, contrary to the aim and result of all wisely ordered courses of study. Said a principal of one of our high-schools to me recently: "The high-pressure system, so popular in our high schools, has made, in not a few cases under my own observation, bright minds stupid." That is undoubtedly not an infrequent experience. That dread malady of epilepsy often comes directly of this pressure. The alarming increase of this fearful disease in late years is traceable, in part at least, to this cause. And the best scholars are those most likely to suffer from this well-nigh incurable and insufferable calamity.

This high-pressure system frequently also disgusts young people with study—creates a distaste, by reaction, for all literary pursuits. They not infrequently feel that if ever they get through the prescribed course of study, they will give books a wide berth. A friend of mine tells me that when he was a boy he was extremely fond of smoked herrings. One day he determined to have all he wanted; and he invested his small change in a large supply, and ate them all! He says that he has tasted herring not once since, and never expects to again! Too much study, as well as too much herring, is not only a weariness but a disgust of the flesh!

This high-pressure system in our schools adds to its other mischiefs that of loose and superficial scholarship. The fact is, that the larger part of our students are unable to make thorough work of so much study in so limited time. Habits of imperfect preparation, and of contentment with the incomplete knowledge of the matter in hand, are formed from which it is very

difficult to become free. These pernicious habits of superficiality, and contentment with superficiality, practically give character to the studies of the whole life. As they were unaccustomed to exact knowledge, or accustomed to inexact knowledge while students, growing out of too much required to render possible exact knowledge, they are in danger ever after of being content with knowing things "pretty nearly almost," in the pithy phrase of the elder Beecher.

And worse than this: This superficiality tends to permeate the whole character—all the thinking and all the doing.

Thus physical health, and intellectual health, and robust moral health are imperiled, and often sacrificed as well as imperiled, by a false method and absurd pressure, without any counterbalancing advantages.

THE CONCLUSION.

Let us hear the conclusion of the whole matter: Have fewer studies in the higher departments of our public schools, or a longer time in the course. The advantages in such a modification will be much every way: Better minds in better bodies,—*mens sana in corpore sano;*—better mental discipline and more intellectual vigor with better health to use them; far grander and more satisfactory results in after life; and the freshness and elasticity and inspiration and joyousness of youth projected into ripe manhood, and beautifying old age.

M. W. Fairfield.

DISCUSSION.

Mr. Lemuel Clute thought the subject an important one. Pupils should not be made to make efforts beyond their capacity. On warm days the lessons should be shortened, and he thought that the people should take the matter in hand and not wait for the school boards to move.

Dr. Jacokes thought that great harm was done by excessive requirements in school. He knew of a large number of students who had been ruined for life by the high-pressure system, even of cases of insanity produced by overwork and the pernicious practice of compelling students to go up several flights of stairs.

Mr. Erwin F. Smith, of Ionia, said he had been a teacher, and was much interested in the subject. In the primary rooms it is often the case that almost everything is sacrificed for intellectual progress. Hardly anything is studied but books. At a late meeting of teachers there were some found who even advocated the giving up of recesses. In many schools it is the custom to keep the children in during recess and after school for failure in their lessons. He thought it a pernicious custom.

Bishop Gillespie supposed the subject had been introduced to enliven the meeting. It could be said that the children had two months in summer and Saturdays for vacation, at any rate. He suggested whether the social life of our young people be not responsible for a portion of these evils that had been mentioned. Is not nervous energy exhausted also by being out late evenings at parties and young people's temperance meetings, missionary societies, etc., as well as by study? He should wish to enquire as to the number of hours of sleep, and also as to the kind of cooking of their food. A part of the work is to promote better cooking. These are also factors in the problem.

Dr. Bachman, of Stanton: The question is, Are we crowding our children too much at school? Are we building up mentally while we are breaking down physically? Which is best—less book-knowledge and a well-developed physique, or a highly-developed brain with a feeble body? Which will best succeed in life? Every physician will say the first. It is barbarous to keep children after school for lessons beyond their capacity to learn.

Dr. Oldright: Look at some of the reasons for the high-pressure system. One reason is that in this country our school time is too short. Boys and girls develop later than in some parts of Europe, so that they should be kept in school till a later period in life; also, capital is less abundant, and so children are kept out of school a part of the time. Some sanitarians say we should not send the children to school at an early age, but we may carry it to an extreme, and keep the child's mind idle too long. We should have more conversation at the table, and thus give the food time to digest; and at other times we should try to impart information, and thus add to their

store of knowledge. The social habits should be more closely looked to, especially the practice of being out late at nights. Certain habits, also, are to be blamed for a portion of the trouble attributed to study, and sometimes the most moral and studious boys are liable to indulge in them. Parents should talk of such matters to their children, and give them suitable warning.

The meeting then adjourned, to meet at 2:30 P. M.

FOURTH SESSION, WEDNESDAY, APRIL 12, AT 2:30 P. M.

The convention was called to order by the President. The minutes of the previous session were read and approved.

The first paper of the session was read by Prof. A. B. Prescott, of the State University, on the subject of Food Adulteration. It is as follows:—

FOOD ADULTERATIONS.

BY ALBERT B. PRESCOTT, M. D., F. C. S., OF ANN ARBOR.

The attention of a sanitary convention might well be engaged with a number of questions concerning adulterations of foods, but at this time it is desired to discuss only a single proposition, namely, that it is plainly a sanitary duty to prevent the adulteration of food, and to proceed without waiting to inquire whether any instance of adulteration is directly injurious to health or not.

It is sometimes said on the one hand, that as a whole the sophistication of foods at the present time are probably not seriously hurtful to health,—that they are deceptions innocent of any other design, and in general free from any other result than that of making money by methods not strictly honest. And it is likewise said, on the other hand, that perchance dire adulteration is even now introducing certain noxious and deadly things into staple articles of nourishment, so that helpless children, and equally helpless men and women, are daily fed with poison. Now at a first view it may appear to be necessary to find out right away whether all these falsified foods are really harmless, or hurtful, and to settle this question to the satisfaction of everybody before undertaking to do anything else. And it may seem plausible that, should it prove true that adulterations are instituted in such a way that they will not poison people, then they may be classed as infringements of commercial ethics, rather than violations of human life, and their indictment ought to be referred to the boards of trade, rather than assumed among the onerous responsibilities of the boards of health. At the same time it might be proposed that should any persons be charged with introducing hurtful articles into food, then the sanitary authorities could clearly establish in court whether such articles are poisonous or not; and if it be decided that they are poisonous, the offenders ought to be punished for crime. But if it be decided in the courts that the articles are not poisonous, then the accused would be acquitted of offense against the public health, and left to such ordinary civil prosecution as might be instituted in the interests of honest trade.

Passing over the difficulty and delay liable to be met in reaching a decision on the question of the hurtful or harmless nature of a given adulteration—a question sometimes dependent upon matters still under investigation—a question upon which different judgments would sometimes be drawn from men of equal competence and fairness—let it be assumed that in a particular case it is

finally decided that the defendant has sold or has made a hurtful or even poisonous adulteration. Then is he to be punished for a criminal offense? Or, if he can show that he did not know the adulteration to be hurtful, or if he can show that he sold the article not knowing it to be adulterated at all, shall he be acquitted of a criminal offense? He can plead that he is as innocent of evil intention as the man to whom he has sold the adulterated article. Certainly we should not desire to have him punished as a criminal. Then he is to be released because of his ignorance, and in this the law places a premium for ignorance on the part of dealers in foods. Skillful men, with an intimate knowledge of materials, are placed at a disadvantage. And with this untoward result, the attempt to institute a legal discrimination between adulterations that are hurtful and those that are not, proves worse than a failure. There was an act of the British Parliament in force from 1860 to 1872, for the prevention of adulterations of food, containing, among other elements of weakness, the proviso that "if knowing that the article were injurious to health," then, and then only, the seller of the adulteration could be held to fine and costs,—and during the twelve years of its existence the law was wholly inoperative.

The English law of 1872 for suppression of adulterations of foods and drugs, made any "admixture, fraudulently to increase weight or bulk, and not declared to the consumer," an adulteration, to be punished by a fine, and by publication. In 1875, the law was further modified by giving still less importance to the question of the hurtful quality of an adulteration. Under these laws Great Britain has taken the place of an unquestioned leader before the world, in legal and in scientific measures to enable people to obtain pure and honest food. In the two years of 1875–6, 15,989 samples of foods and drugs were subjected to systematic analysis under the British law, and of these 2,895 were found adulterated, and dealt with by moderate penalties. In the single year of 1878, 15,107 analyses were made, and 2,505 adulterations revealed. Of these, 5,068 analyses, and 932 adulterations, were of the articles milk and cream. Under the mild and equable operation of this law, there has been, year by year, a decrease in the number of adulterations found, in proportion to the analyses made. In 1872, the proportion of adulterations was 65 per cent; in 1878, it had fallen to 16.6 per cent. In Canada, under a law similar to that of England, the percentage of adulterations found was 50 per cent in 1877, and 33 per cent in 1878, over 800 analyses being made in the year last named.

It is not claimed that all the success of the English law is due to those provisions which forbid the sale of adulterations that are harmless to health; and it is not here desired to discuss all the conditions of an efficient effort by the State for the suppression of falsified foods. Indeed at this time we would not inquire how the work is to be done, or by whom it is to be done, but we desire to arrive at a conclusion as to what needs to be done, to the end that the people may have honest foods. As sanitarians, we may work by a general instruction of the public, or we may ask the Legislature to enact a law, or we may institute systematic analyses of fraudulent foods, and spread the reports, with names of offenders on the pages of the press; or we may try some method other than these, but at all events we must have a clear view of the objective point to be reached. And that objective point, we define to be, the prevention of adulterations of foods, as a sanitary duty, whether the adulterations are directly injurious to health or not.

Let us enquire what food is to man. It is the substance that builds the fibre of muscle and of bone; it is the force that supports the steady work of the heart, the even movement of the lungs, the full power of the brain, the quiet steadiness of the nerves. If a horse is to be trained, careful attention is given to its food. The human body requires more fine and sturdy materials than the body of the horse. The forces of physical life in man demand a more generous sustenance than the forces of life in an animal. Food modifies manhood, and influences national character. True, other resources of life, as those of the atmosphere in respiration, are quite as important to the vigor of life. But our food is the more valued because it is not provided with such redundance as to be had without effort. We must work for it, therefore we value it. Indeed it is labor that gives existence to estimated values, and wealth is mainly a means of procuring food. In a highly civilized community, no less than in a primitive condition of society, the largest expenditure is that for subsistence. The wages of toil, energy, intellect, the result of time, all go to buy food.

Opposite to food is poison. We fear to be poisoned even more than to be starved. Animals are given instinct to find their food with rejection of poison; man does the same by reason and observation. With the advance of manufacture, the reach of invention, and the competition for gain, man is required to exercise greater and greater care, both for the exclusion of poisons, and for the selection of suitable nourishment. In the course of commerce, food comes through many hands. Tests of skill are demanded, and safety requires that the invention of the analyst shall keep pace with the invention of the manufacturer. But it is not for poison alone, that scrutiny must be devoted to food. In the failure of good faith, a thousand tamperings may occur. A poorer article is substituted for a better one, a cheaper thing is coated and colored to imitate one of more value, an article of good quality is diluted for greater weight or volume. Foods are purchased and used, under the name and upon the reputation of articles belonging to another hemisphere. A man proceeds to select suitable food for his family, and is robbed of his privilege of choice, by the unrestricted circulation of counterfeits. As said in the bitter voice of a poet not often bitter,

> "Chalk, and alum, and plaster are sold to the poor for bread,
> And the spirit of murder works in the very means of life."

The wrong may be done in the spirit of gain, rather than that of murder, but none the less it becomes a robbery of "the very means of life," and robbery of the rich as well as the poor. And this is the meaning of adulteration in food.

Who is the primary guardian of the food of any person? By whom is it to be selected and devoted to use? Evidently by the person himself, or by those of his family, or by those whom he engages for that explicit service. You and I are to decide for ourselves what we are to eat. This is the inevitable rule, and if there are any exceptions they are justified in the claim that they regard articles which in effect are narcotics rather than foods, or in the claim that they affect persons not safely left to their own control; and the advocates of these exceptions distinctly acknowledge it to be the rule, that it is the right of the individual to be responsible for himself in the choice of food. We do not at all forget that there is a sanitary power in the State, as unquestionable as any power exercised in the law of the land. But the sanitary councils of the State must place trust in private responsibility for the care of health. And

because of this dependence, it is proper that the law should afford a sanitary protection of personal rights in the choice of food.

Therefore fraud in food should be prevented, not only because it is a violation of individual rights, but especially because it is a violation against a safeguard of health and life. Some rights are more sacred than others, and are worthy of special means of preservation. The defense of rights important to health, is not only a duty for the sake of justice, but a duty for the sake of human life as well. And personal protection against all fraud in the sale of food is altogether important to the public health, whether particular frauds are known to be hurtful or not. An adulteration is a fraud, a deception, a counterfeit. It is systematically concealed from the purchaser. Its object is to induce people to accept an article which they would not accept for the use then wanted, if it were not for the deceit. To sell an admixture of coffee and chicory, if the terms and proportions of the mixture are printed on the wrapper in a way to have them seen by the purchaser, is not adulteration. To sell oleomargarine under its own distinctive name, with no credit borrowed from butter, is not an adulteration. But to supply sugar made from corn-starch for the ordinary sugar made from cane-juice, or to deal out milk-and-water or skim-milk for entire milk, is an adulteration—a violation of the right of the consumer to obtain his food upon his own discretion.

Nevertheless certain defenses are made whenever an extensive adulteration is exposed upon sanitary grounds. First, the plea is made that the adulterated article which the consumer did not design to purchase, is quite as wholesome to health as the real article that was called for. Let it be answered that this plea is not to be heard at all; it belongs to the consumer to judge for himself what he will provide for his own table. The manufacturer and the dealer have no right to spread even the best of oleomargarine upon a slice of bread, without the knowledge and consent of those who are to eat it. If the law itself cannot invade my right to furnish my table in my own discretion, if boards of health and medical associations can go no further than to present advisory information about my diet, certainly the manufacturer and the grocer, as private parties, cannot justify their substitutions by the plea that they know better than I do what is suitable for my digestion. Second, it is urged that, as the adulteration was done only to make money, and really does not affect health, it cannot be objected to on sanitary grounds, but must be dealt with under general laws against deception in trade. Let it be answered, that while the falsification was not committed to injure health, it is a violation of a great safeguard of health, the discriminative care of people about their nourishment, and it is therefore directly objectionable upon sanitary grounds. Third, it is objected that people are not really deceived by the current sophistications of the day, which are so extensive that they are understood, tolerated, and even preferred by consumers. To this, let it be replied, if the pretense is so thin as to deceive no one, and if the admixture is in demand for use as it is, the pretense can the more easily be dropped, and at any rate the admixture must go under its own description and by its own name. Not a single article, unless indictable as a positive poison, need be withdrawn from the market. It need only be required that true names shall be substituted for false names, and every addition and alteration shall be declared in evident terms. Let a spade be called a spade. Let alum baking powders be named as such. Let the term Vermont Comb Honey be changed to a Preparation of Glucose and Paraffine. To these corrections there can be no cogent objection.

But all objections fail alike upon considerations of principle—in maintaining the personal right to self-preservation,—and upon considerations of expediency—in fostering a wise prudence regarding the nourishment of the body.

To permit foods to be commonly falsified without publication and without protest is to leave a vitiating influence upon the people. Sanitary publications and sanitary laws should endeavor to foster that delicate scrupulousness as to the cleanliness and purity of food that is natural to civilized man. A critical attention to diet, in its physiological relations, should be helped to go deeper than the indications of taste and appearance, and should be guided in an adaptation to the especial needs of temperament, occupation, exercise, and personal habit. It is an education of the public to call attention to the composition of foods, and to expose imitations.

When the public, in any country, become really intent upon providing themselves with honest food, they will be likely to demand, for their own convenience and security, that dishonest foods shall be suppressed by law, and the demand will persevere until law becomes efficient. The scrutiny of the purchaser cannot go to the extent of watching for every new device in the improver's art. Nevertheless, the progress of adulteration can be held back to a great extent, without the help of the law, by the power of well-informed public opinion. Demand brings supply, and the more clearly the public will define their demand for honest foods, the more nearly will such be provided. When it becomes apparent that any food or condiment on the market is falsified, it should be refused. Indeed, in certain articles, at the present time, a wholesome public distrust has well nigh driven counterfeit goods out of use.

One of the most stupendous substitutions ever accomplished is now in the height of a brief career in this country. It is the annual manufacture of as much as a third of a million of tons of corn starch sugar, all of which steals its way through the avenues of trade to the hands of consumers under the guise of ordinary cane sugar. The solid sugar—called grape sugar at the factories—is mostly mixed with cane sugar. The syrups—called glucose—require but little mixture of cane syrups to fit them for the market. While real cane sugars have long been carried through the course of trade at slight and insufficient profit, the consumer of this article probably pays from 300 to 800 per cent above its cost. It is stated that the factories could sell it at 1½ to 2 cents per pound, and do sell it at 3 or 4 cents per pound. It is sold at as good prices as other sugars—but it is not sold at all to consumers under its own name, so far as can be learned. An article of unmixed grape sugar, pressed in cubes, is sold as cut sugar. If grape sugar can be bought, as such, at a grocer's anywhere, let it be known. Now, it is claimed that this article is wholesome when made free from chemicals, and that it is now generally made as pure as the most of cane sugars. The weight of opinion, of chemical and medical authority, is favorable to its claim as a wholesome saccharine food. However, the suitability of any article of diet, for digestion and for assimilation, must be learned by experience, and no experience can be gained about an article that hides under the name of another substance in use along with it. The people distrust it, and believe very damaging reports about it, and will not have it imposed upon them much longer. In distrusting it the public is right, fully right, and so long as it will not come to the consumer under its own name it deserves to be treated as an outlaw. When consumers can buy

it, unmixed, or even in definitely stated mixture, they will find out whether they want it or not, and it will be ascertained what it is good for, and to what uses it is adapted. To this end it must soon arrive, and the sooner the better.

Another manufacture of extensive proportions is that of purified beef tallow, prepared for table use, and colored to resemble butter. Under the name of oleomargarine, the public has been well advised that, though it may be wholesome nourishment, it is not butter, and under this adopted name, which serves to distinguish the article, though it is a misnomer, its presentation to the public is wholly legitimate. As a digestible food, it probably will be found to rank much below butter. But it is difficult to learn or imagine where all the oleomargarine that is made finds a sale, if sold under its own name. It mostly goes out of the country, it is said, and we may hope this is true unless it is sold here for what it is. In England we know that the public analysts are well prepared to cope with it, the difficult task of butter analysis, by the constant labor of skillful chemists, having been finally well achieved. At present it is only difficult to find small proportions, up to 15 or 20 per cent of it, when in mixture with rancid butter.

Another article, of very much less consequence, ought also to be placed by name in the retail trade, as it has been for some time in wholesale lists. This is P. D. What is it? Something manufactured by the ton, and known to the dealers as P. D. There are varieties of it, slightly different in shade, fineness, etc.,—P. D. ginger, P. D. cloves, etc. Ask your grocer to get for you some P. D., and then furnish you undiluted spices, so that you can make your own Pepper Dust mixtures to please your taste. There are other names figuring by tons upon the books of wholesale dealers, yet never reaching a mention to any consumer anywhere. At what grocer's can you buy a pound of terra alba, to find for yourself what it is good for? According to the late report of analysts for the New York State Board of Health, there would be an even chance of obtaining eight samples of mixed terra alba in purchasing twenty-seven samples of cream of tartar, in some of these mixtures the white earth reaching 93 per cent of the article.

The farcical character of many of these wares may well cause the public to feel that they are not only the victims of injury, but the subjects of sport, at the hands of the food-makers. We cannot afford to be amused at the trifling, for the laugh is against us. And the funny side of the business does not blind our eyes to the fact that on the whole it is a serious business, in which we are all concerned, and that unmeasured dangers are hidden in it.

We say the dangers are unmeasured. In a certain sense they are often overrated, in another sense they are generally underrated. They are overstated when sensational declarations are made of the deadly poison put into common food. No good comes from parading percentages of nearly inert sulphates under large headlines as "vitriol mixture." The public are not instructed when, for the hundredth time, Hassall's obsolete conjecture of a possible adulteration of milk is brought forth in the revelation of "Sheep's Brains," with three exclamation points. Candor and correctness are becoming to those who would work for any reform. But the dangers of adulteration are underrated when it is for a moment supposed that any falsified food can be tolerated without depraving the public purpose and impairing the sacred safeguards of human life. Out of fraud and colored fiction, sturdy vigor and physical independence do not naturally grow. It is high time that the demand for honest foods should be heard in terms taking no denial.

This paper was discussed by Dr. Avery, Rev. M. W. Fairfield, Dr. Cassidy of Ontario, and Messrs. Clute and Smith of Ionia.

Rev. Dr. Jacokes, of the State Board of Health, then delivered an address on the subject of "Pure Air, Why we Should Have it, and How we Shall get it."

PURE AIR, WHY WE SHOULD HAVE IT, AND HOW WE SHALL GET IT.

SUMMARY REPORT OF AN ADDRESS BY REV. D. C. JACOKES, D.D.

Rev. Dr. Jacokes remarked that the laws of health are all simple and easily learned. First learn the facts, then the laws governing them, and then—obey them.

Five years of his ministry he had lived out of doors at all times in the year and had never been in any way injured thereby. Pure air never hurt any one —want of it has killed thousands. Women and children suffer more from impure air than men. The whole house, and especially the sleeping-rooms should be well ventilated and full of pure air. In winter we must have the cold out-door air brought into contact with a heated surface before breathing it. He highly recommended a sheet iron jacket around the stove for this purpose. Avoid drafts, and in ventilating from the windows always lower those on the side opposite the wind. Certain things contaminate the air. Avoid wall-papers. They are quite likely to harbor disease-germs, and the bright colored ones contain arsenic. If he were going to build a house he would never have any wall-paper in it. Cellars are frequently a source of disease. They should be thoroughly drained, and be kept scrupulously clean, good whitewash being applied all over the walls and up under the floors. Clean up and keep the ground pure all around the house. He mentioned the Eastern Asylum for the Insane at Pontiac as an exceedingly well ventilated public building, quite in contrast, for instance with the council room in this city, where he had contracted a violent cold. He referred in strong terms to the impure air frequently found in churches. Ministers should have some sense in this matter. He would prefer never to go to church than to breathe the vile atmosphere which stagnates from one week's end to another in so many of our churches.

DISCUSSION.

Hon. H. H. Holt remarked that the old idea was to ventilate from the top. The only proper manner is from the floor, since there we find the cold, impure air, which is heavier than the warm air above, and which contains the carbonic acid gas, the harmful product of respiration; when ventilated from the top the warm and pure air is taken off instead. On this account the old fashioned bedsteads were good, being up so high.

Dr. Jacokes remarked that the pyramids were ventilated from the floor.

Dr. Oldright spoke about summer ventilation. In summer the outside air is rarely above 90°, while the temperature of our bodies is 98°, and they are generators of heat. With this condition of things, would it not be a good plan to let out the hot air from the top?

Dr. Jacokes said that at the asylum at Pontiac they have a ventilator at the top to let out the hot air in summer.

The next paper of the session was by O. G. Fox of Greenville on the Sewerage of Greenville. It is as as follows:

SEWERAGE OF GREENVILLE.

BY O. G. FOX, OF GREENVILLE, MICH.

Among the most difficult questions in sanitary work is the removal of waste matter from our homes, and the accumulations of filth from the streets and public places in our towns and cities. It must be got rid of speedily or we see its effect in various kinds of diseases, which, though not always assuming an epidemic form, yet the seeds seem ever present and ready to germinate.

Scientific research has declared that these forms of disease are preventable; and in suggesting methods for their prevention much importance is attached to the development and maintenance of a proper system of sewerage.

In the disposition of sewage, it is agreed that the immediate and regular removal is of the first importance. Nothing can be much worse than the privy-vault and cesspool. The soil is contaminated. The source of water-supply is poisoned. And the custom, if followed for any great length of time in thickly populated parts of the town, cannot fail to produce disease and death. "Accumulation of filth in the soil has made the site of many an ancient city untenable."

The dry-earth closet is an improvement upon this old and vile system. But the success of that depends upon the utmost vigilance, any neglect of which is fatal; and on this account it cannot be recommended for towns as large as this, and especially where a system of water-carriage can be so cheaply and easily maintained as here. It will not do for men to say that the methods of our fathers are good enough for us. That rule can with as much propriety be applied to everything with which we have to do, and would be an effective barrier to all progress.

There are few places that have good water and cheap power so convenient; and it would be presuming a lamentable want of public spirit to conclude that this city will long be without a good system of general water-supply. Upon that depends the success of a general and perfect system of house-drainage. But do not wait for city water-works. Let sewers be constructed. Water will increase their usefulness, but they are a necessity without it. They are much needed for the proper disposition of storm-water and street-wash. They are also necessary to the successful operation of a public water-supply, and should be planned and at least partially constructed in advance of the water-system.

Nothing has so far been done towards the drainage of this city, except to grade some of the streets, lay stone gutters on the business part of Lafayette street, and put in a small drain pipe from Lafayette street to the river on Washington street; and it would seem wise to defer further work in this direction until some well-considered plan shall have been adopted.

The problem of drainage here is not so difficult of solution, and will not involve the expenditure of so large an amount of money as in many places containing a less number of people. There is but little low land within the city, and little, if any, provision need be made for sub-soil drainage. If the rainfall and sewage be provided for, all the requirements will be met in most parts of the city; and no doubt it will be found practicable to combine the carriage of rainfall and sewage in one system to a large extent.

No better time than the present will ever be found to decide upon a plan. It should not be delayed; and it is equally important that the subject be thoroughly investigated and the right plan adopted.

The principal reason why the sewerage of towns and cities has so many objectionable features, and the whole system is so often condemned, is attributable to the fact that the people do not move in the matter until they are compelled to by a terrible rate of mortality, or are forced to act from the impossibility of longer continuing old customs. Then something is done to tide over present difficulties, without definite plans or regard for future necessities. This course pursued for several years results in an expensive, an inadequate system, that has cost too much money to be abandoned, and is justly condemned by the people who have paid for it. This I find, with but few exceptions is the history of sewerage-construction in this country. There is now no reason why this history should repeat itself in this city. We can have the benefit of this experience, and there will be no excuse for us if we fail to profit by it.

With regard to the best course to pursue in the development of a desirable sewerage-system, the first step should be the preparation of a map from accurate surveys of the entire city, showing elevation of streets above a certain fixed point, also high-water level of the river. The State Board of health and a competent sanitary engineer should be consulted. The average rainfall of this vicinity should be ascertained as near as possible. This will determine the size of sewers where storm-water is to be admitted. Their form is also important. That most approved is like the long section of an egg, with the small end down so that the bottom is narrow and smooth, and though covered with only a small amount of flowing sewage is not likely to collect any great amount of deposit, even though the capacity is many times the requirements of house-sewage alone. This form admits of providing capacity for carrying the water of heavy rains without meeting with the difficulties always encountered in the flat bottom or large round sewers of large quantities of solid matter adhering to the bottom and sides, sometimes to such an extent as to block the openings and create offensive exhalations by decomposition. The object sought is to provide channels for carrying sewage to its destination rapidly. Proper form, smooth surfaces, and true gradients with means provided for cleansing places where deposits are likely to occur will accomplish this. The sewage will then pass off before the dangerous stage of decomposition sets in. Such construction will provide, as far as it is possible to do so, against the exhalation of poisonous gases. But the accumulation of such gases as may be generated must be provided for by thorough ventilation.

The subject of ventilation in large cities (where long lines of sewers with slight inclination are in use) has been much discussed, many plans suggested, and experiments tried. But in such a system as can be constructed in this city where any desired inclination can be secured, frequent openings, furnishing the gases with free access to the open air and dissipating them as fast as formed (if the connections with buildings are properly trapped), will give satisfaction and be found free from serious fault. The difficulties encountered in this much vexed question will not be found so serious if the remedy is applied to the root of the evils as they appear.

A condition of foulness implies a necessity for a thorough and complete cleansing, and the adoption of means to prevent a recurrence of the foul condition. To make large and frequent openings—if the construction and operation of the sewer is imperfect—will vitiate the atmosphere and furnish cause for disease. To trap all inlets and seal up all openings,—the plan usually resorted to,—makes the badly constructed sewer little better than an elongated

cesspool, a receptacle for the storage of all the material that is necessary for the exhalation of the foulest gases. The idea in this plan seems to prevail that these noxious vapors can be confined within the sewer or forced out with the sewage. This is a fatal mistake. A slight pressure will force house-traps, and these gases will fill the pipes and find their way into our homes through imperfections in plumbing. They will also find their way through bad joints in sewers and drains into the earth. They will invade our cellars and rise through hot-air ducts and other openings to the rooms above. The earth is porous and these gases will from various causes, such as wind-pressure, difference in temperature and elevation, rapidly pass through the soil. To see this fact forcibly illustrated we have only to note the rapid diffusion of coal gas from an imperfect main. Instances are on record of people in houses sixty feet from a broken main being poisoned when gas was not used, and no connection made between the building and the main.

These facts prove the fallacy of all attemps to seal up and confine within the sewer the gas that is generated there. Undoubtedly the true plan is to so proportion and construct sewers that with a good system of flushing the sewage will pass rapidly to its destination. Small sewers are better than large ones, and when it is necessary to construct a large one to carry off the rainfall of a large area it is best not to connect house-drains with such a sewer, but to provide a smaller one with only sufficient capacity for the service required.

There should not be in this city many difficulties in the way of the construction of a satisfactory system of sewerage. With such a work completed, in connection with a water-supply for fire protection and potable use, with streets all graded and graveled, the material for which lies in abundance in the very center of the city, this would be one of the most healthful and attractive places in the State. These improvements would induce people to come here from less desirable localities. New enterprises would at once spring up, and prosperity in all branches of business would necessarily follow. Aside from the urgent and important reasons for these improvements, based upon the increased healthfulness that would necessarily result, the profit from the investment in a business form would begin at once to be realized.

I would not countenance an extravagant expenditure of public money; I would try and look upon this matter from the same standpoint that a careful business man views his business interests, and when it appeared necessary,—as it now does,—for the health and comfort of the people living in this city, and absolutely essential to the lives of their children who are soon to take our places, and when from a business standpoint returns are likely to be so soon realized, it would seem to be folly to longer delay prompt and efficient action.

Dr. Wm. Oldright then delivered an interesting address on the exclusion of sewer-gas from houses. Before beginning his address he paid the Michigan State Board of Health a high compliment by saying that it was regarded by outsiders as the ablest and most efficient Board of Health on this continent. They had come here as representatives of the newly established Provincial Board of Health of Ontario, to learn the methods of work used by the Michigan Board and introduce them in their country. A report of his address follows:

THE EXCLUSION OF SEWER GASES FROM HOUSES.

BY WM. OLDRIGHT, A. M., M. D., LECTURER ON SANITARY SCIENCE IN THE TORONTO SCHOOL OF MEDICINE, AND CHAIRMAN OF THE PROVINCIAL BOARD OF HEALTH.

Mr. President, Ladies and Gentlemen:

I have been requested since my arrival to address you on some sanitary subject, and will therefore make a few remarks on the means to be employed to exclude from our dwelling the gases generated in sewers.

Some injurious gases reveal themselves unpleasantly to the nose, whilst others do not. These last are so insidious in their nature as to be doubly dangerous. As examples, I may refer to the baneful results which ensue from living in houses under which water lodges and becomes stagnant. There are, I believe, few medical practitioners who have not witnessed these results. The miasmatic poison of ague is similarly inodorous, or has no necessarily unpleasant odor. In like manner sewers have sometimes very little unpleasant smell. In some cases we have a faint smell similar to that produced by those burning-fluids into the composition of which fusel oil enters. People living in a house become so accustomed to these faint odors as to take little notice of them; and with some people the sense of smell is not very acute. Hence we must be very careful how we accept negative evidence as to the presence of noxious gases. And hence, too, we must be all the more careful to avoid their existence and presence, and to devise means to this end.

It is plain that to prevent the constant accumulaton of noxious gases, we must in the first place get rid, as far as possible, of decomposable material before it begins to decompose; and secondly we must see that the noxious gases from any decomposing material which has evaded our care do not reach us. How simple these two propositions are! And yet, in practice, how difficult of execution; but as the difficulty arises from the ignorance, and partly consequent carelessness, of others, we may accomplish much by constant vigilance and by working away until we do get proper means adopted for accomplishing these objects.

As regards the first of these it has become an acknowledged desideratum amongst sanitarians that all decomposable material entering sewers should pass out of the sewer-system within twenty-four hours. For the accomplishment of this object many points need careful consideration, such as the materials of which drains and sewers are to be constructed, their course, their slope, the construction of their joints, the course of their junctions, the facilities for flushing them; but these points I shall not have time now to consider.

The main subject of these remarks is how to dispose of the gases necessarily generated in the sewers.

Sewer gases are in practice disposed of in three principal ways:

1. In a very large number of cases they are allowed to escape into the inside of dwellings. To such an extent is this the case that some sanitarians advise us to abolish sewers altogether, an advice which is not practicable under existing circumstances.

2. In some instances they are supposed to discharge through gratings in the centre of the road bed.

But in many cases they discharge at the edge of the sidewalk through the

traps of gullies emptied by evaporation. Examples of this may be seen at many of our street corners in winter time.

The ventilating gratings of sewers are so often clogged with dirt that they are of little value in disposing of the total amount of sewer-gas.

3. In a few cases the sewer-gas is discharged above the house-tops. I think very little consideration will suffice to show that this is the proper method and we must use our exertions to make it general. It is surely safer to discharge it away above our heads than at our very feet.

By referring to the diagram which I show you, you will see that this can be accomplished by extending a pipe from the house-drain up to and above the roof.

It would be almost satirical to say that we ought to use all endeavors to prevent the first method of disposal; and yet the vast majority of people, professional and otherwise, act as if it did not matter much.

Let us then consider how sewer-gases obtain entrance into houses.

1. In some cases there is no "trap" interposed between a drain or sewer and the air is respired by the inmates of the building served by that drain or sewer, no attempt at any mechanical impediment to the return of sewer-gas. This, of course, should not be the case. Some form of trap should be placed as near as possible to the commencement of every waste-pipe. [Here were shown diagrams of a variety of traps.]

2. Where there are traps they are liable to be forced. Some persons think if they have a trap all is right, but let me say that a trap without a vent is of hardly any practical value. A trap with a protecting depth of water (commonly called the "seal") of three inches (a three inch seal) only resists a pressure of some two ounces to the square inch.

I hold in my hand a trap with a good seal, which I have filled with fluid; [See Fig. 1.*] If the vent is closed you will see the fluid displaced by my blowing, even with a slight force, into one end of the tube. If I now uncork the opening between my mouth and the water in the trap, I can blow my hardets without displacing the fluid.

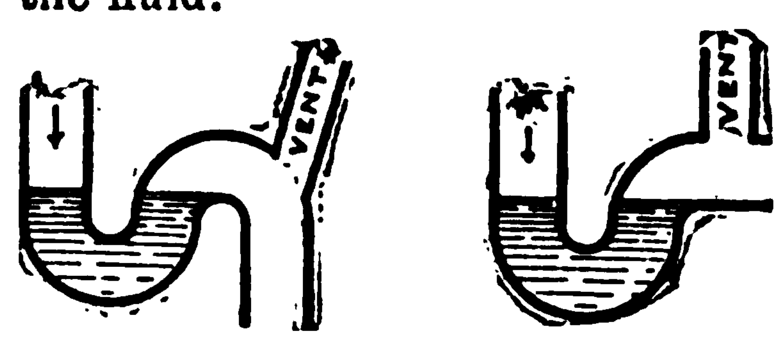


FIG. 1.

Now, what influences are at work to force gas back through traps?

a. The expansive force caused by pouring water into a drain. Two bodies cannot occupy the same space at the same time. If the lower part of the drain be full. or its mouth closed by water in the sewer into which it empties, then the sudden pouring in of water will cause the confined gas to burst its way back through the trap.

b. Storm-water suddenly filling the sewers has the same action.

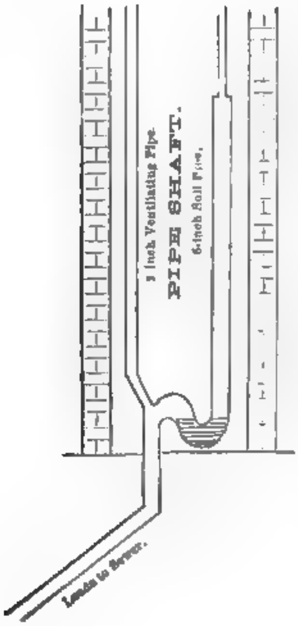
c. The expansive force of hot water entering and increasing the temperature and consequently the bulk of the air. If raised suddenly from 50° to 150° the result would be a pressure equal to nearly seven feet head of water.

d. Direct afflation through the sewer. The wind blowing up the sewers will force the sewer-gas backwards. Some engineers have proposed flap gates

[* For the use of the cuts of figures 1 and 2 we are indebted to the State Board of Health of Massachusetts. They were made to illustrate an article by Edward S. Philbrick, and published in its Report for 1876.—H. B. B., Sec. S. B. of H.]

[For the continuation of page 214, see page 215. Pages 214a and 214b have been inserted since pages 214 and 215 were printed.]

HOW NOT TO DO IT.



[On page 216, in the third paragraph, Dr. Oldright refers to a diagram, which was not received from the engravers in time to be printed with the report, and consequently is shown on the left side of this page. In explanation of the point made by Dr. Oldright, it may here be stated, that it is now generally understood among sanitary engineers, that foul odors and perhaps dangerous bacteria and other products and causes of decomposition are found in soil pipes where there is not a free and constant circulation of air; and that it is considered about as essential to prevent access to living rooms of such dangerous elements from the soil-pipe as from the sewer itself. This is usually attempted by securing a constant current of air in the soil-pipe, by means of another pipe of the same size joined to it at its lower end and extending up above the roof, the two pipes being so placed as to be subject to different temperatures; or, a current of air is provided for by having an air inlet to the house-drain on the house side of the trap, which is between the house and the sewer. By either of these plans it is essential that the house-drain and soil pipe shall be unobstructed by traps, and the soil-pipe should extend *full size* to the roof, and not, as in the instance referred to by Dr. Oldright, be reduced in its upper portion to a two-inch pipe.—H. B. B., Sec. S. B. of H.]

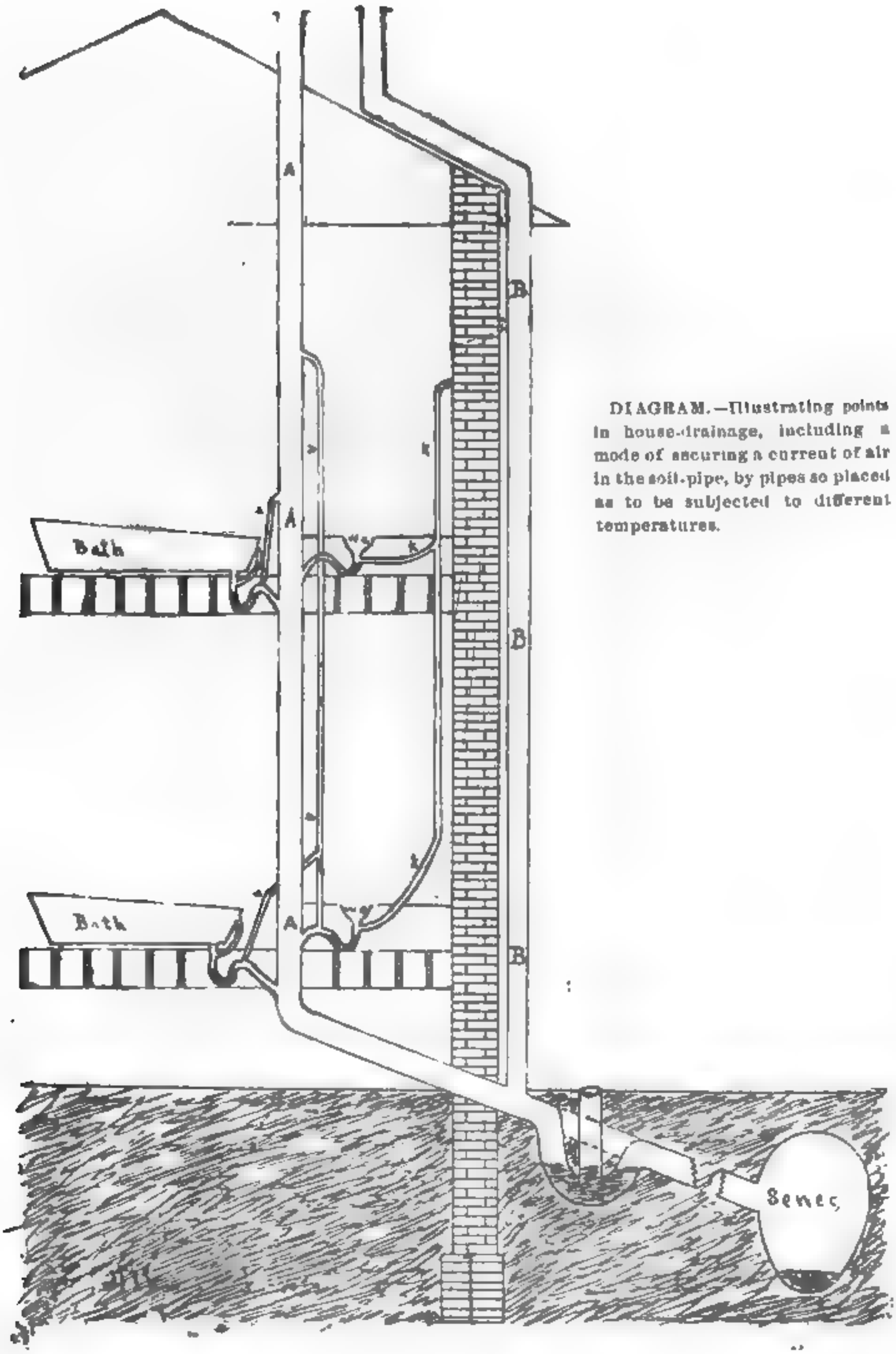


DIAGRAM.—Illustrating points in house-drainage, including a mode of securing a current of air in the soil-pipe, by pipes so placed as to be subjected to different temperatures.

at the mouths of sewers. But don't have this; let the fresh air blow up, but make vents for it to sweep through and purify the sewers.

e. Partial choking of the drain gives rise to confined air constantly increasing and expanding and being displaced. A vent allows the escape of all gas which would otherwise force the trap.

3. Again, sewer-gas may be admitted by the trap being emptied by syphoning, the water being syphoned out. If I add to the distal end of the trap a tube bent downward, it forms the long leg of a syphon, the portion of the trap to which it is added being the short leg; if a full stream be poured through the trap, the water will syphon out of it, leaving the seal broken, as I have often proved by actual experiment. An opening at the arch of the syphon will of course prevent this.

I have been asked if the trap of a waste-basin could be syphoned in this way, the pipe below being generally larger than the exit from the basin. I have seen at least two cases in which this occurred: one a kitchen-sink, which had to be remedied by inserting a vent tube; the other, a waste-basin, which may be still experimented upon in a certain hotel in Toronto.

4. A large body of water rushing full bore down a pipe into which a trapped tube empties will suck the water out of the said trap.

The vent, will, of course, prevent this.

5. Alterations may leave some pipe open or unsealed.

6. Disuse of a trap for a long time will allow evaporation and emptying of the trap, giving room for free passage backwards of gas. Very lately I saw a bad instance of this in a public building in Toronto.

7. Corrosion of pipes and traps, or bad workmanship in joints, will often allow escape of gas.

8. By absorption through the contents of traps, gas is often absorbed and given off. Dr. Fergus, of Glasgow, experimented with ammonia, and found it transmitted in about twenty minutes.

This may be obviated by having a second main ventilating-tube, and these two will form a circulation (as shown in the tubes A and B in the diagram opposite), preventing foul air from accumulating—stagnant—at the trap.

In a system of house-drainage, one of these two tubes may be secured by running a 3 or 4 inch pipe (B) from the sewer, just outside the house wall, up to the roof, clear of cornices and windows; whilst the other will be obtained by continuing the soil-pipe (A) up through the roof. A difference in temperature in the pipes will cause the air to circulate through them. This last named pipe will save the traps opening into it from being forced by gas from the sewer and drain. The traps of the baths and lower closet—all traps in fact below the uppermost one — must be saved by their own vents (v, v, v, v,) from being syphoned by sudden liberations of water above. These vents may open into the extended soil-pipe above the highest trap.

In the diagram, pipes (k, k, k) will also be seen rising from a point below the hopper of the closet, a little above the water in the trap. These pipes may serve a double purpose. By branches from the water-closet tanks they may act as flushers to the water-closet traps, and they may also ventilate the water-closets. They may lead to the outer air or the chimney-flue of an isolated kitchen in constant use, but never into a bedroom chimney or any other not used *constantly* in the strictest sense of the word. *This permission I would not grant in the case of any tubes which have direct connection with the drain,* and yet I know this to have been done.

As for the trap shown between the house wall and the street sewer, I would

leave it out of this system, were the system to become generally adopted (as it should be by by-law), and would carry the drain directly to the sewer as shown by the dotted lines; for as I remarked before, a point away up thirty feet or so above our heads is surely the best place to discharge the gas from our sewers, and not at our feet. But if the plan were not general then I would yield to a very pithy remark made by my friend, Dr. Joseph Workman, late of Toronto Asylum, "not to ventilate the whole street on the house-top of one" enterprising individual; although if I were the individual and the street-ventilator were in front of my house, I think I would then be still worse off by having it there than by having it on the roof of my house.

It would be still better, even in a general system, to leave the trap in the position shown, if we could have a third ventilating pipe running up on to the roof just outside of the trap and between it and the sewer. We would thus lessen the danger of even *diluted* sewer-gas finding its way into apartments through corroded pipes or defective plumbing.

As we have all come here to interchange hints on sanitary matters I trust it will not be considered ill timed or obtrusive in me to illustrate by a diagram how this circulation by double pipe is defeated in one of the asylums of your State. You will see that there are two tubes all right, but a trap is placed between them, and even if this trap were removed the circulation would be defeated, the columns of gas in both tubes being maintained at the same temperature and weight by the tubes being both in the same heated chimney.

[The diagram given in the report of Dr. Oldright's remarks was copied from the Report of the Board of Building Commissioners of the Eastern Michigan Asylum at Pontiac for 1877-8.]

Before concluding, Mr. President, I would enter a protest against that very common form of closet, the pan closet, of which I here show a diagram. The passage from the bowl into the receiver, is closed by the pan, holding water and preventing the constant passage backward of gas when the closet is not in use. But when the handle is drawn up the pan is deflected downwards so as to discharge its contents into the receiver, as shown in the diagram; and as two bodies cannot occupy the same space at the same time we have forced up from the receiver the gas rendered doubly foul by the repeated coatings of fæcal matter adhering to its wall as it is dropped into it from the pan.

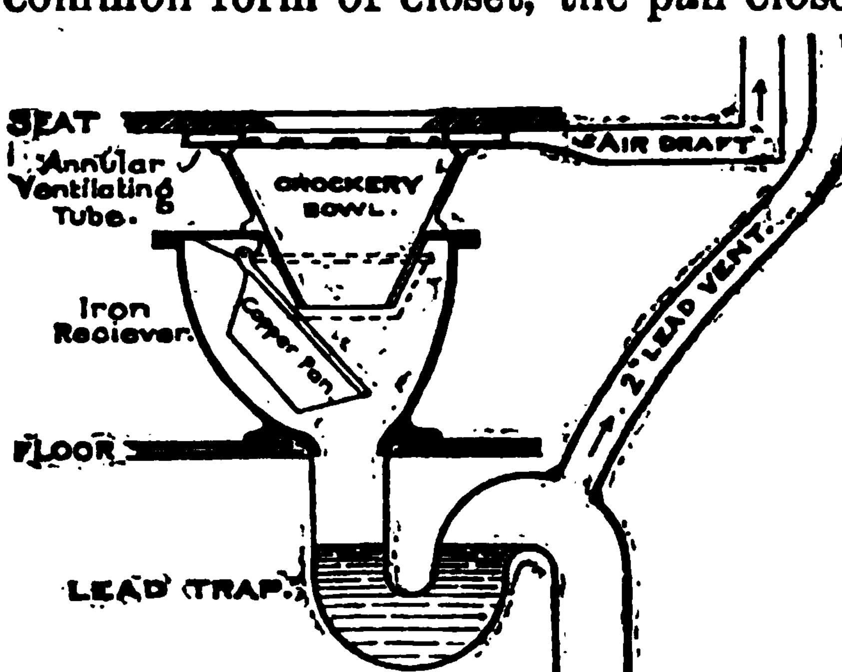


FIG. 2.

There are good forms of patent closets, but the simple hopper with a good swirl of water to keep its walls washed clear of fæces whilst in use, and with an occasional flush, is quite as good as any and better than many. Its trap should be placed above the floor so as not to leave a long tube between the bottom of the hopper and the surface of the water in the trap. This lessens to a minimum the surface for filth accumulation. The trap is also more accessible if broken tumblers or other impediments should get into it.

In concluding these remarks I must thank you, Mr. President and members of this convention, for the kindly manner in which you have invited my colleague and myself to take part in it.

[In private conversation with some gentlemen after recess, Dr. Oldright pointed out that a foul odor often proceeded from the fact of a space being left between the seat and top of the hopper where urine or other water may slop over.]

The next paper was on "School Hygiene," by Prof. E. P. Church of Greenville. It is as follows:

SCHOOL HYGIENE.

BY E. P. CHURCH, SUPERINTENDENT OF THE GREENVILLE SCHOOLS.

School life is, with us, contemporary with child-life. It embraces the formative period of the child, physically as well as intellectually. When we remember that every boy or girl that completes a course of study in our graded schools, spends twelve years of 200 days each in the schoolroom, we feel that no apology is needed for calling the attention of this convention to the subject of school hygiene. These years afford sufficient time to establish the child in habits of independent thought and study, and to give direction to his mental character. During the same time the body is equally affected. The foundations of health or disease are often permanently laid during the school life. I do not believe that the requirements of school, in the direction of study, impair our children's health as much as inconvenient and ill-contrived school-houses do. With all the discussion of the various exhausting demands of our public schools, and the charge that they induce premature debility and lassitude, especially in our girls, let us see if the architects of the schoolhouses are not the real offenders.

And, first, let us consider the matter of ventilation. Every child exhales a cubic foot of vitiated air in four minutes, and needs an equal amount of fresh, pure air for inhalation. A school of forty pupils, according to this estimate, will call for ten cubic feet of fresh air every minute. Now, the problem is to remove the vitiated air from a room, and to furnish a supply of pure air, for it is utterly impossible to introduce any appreciable amount of air into a room, unless an equal quantity is at the same time taken from it. Few persons who have not tested the quality of air recently breathed from the human lungs have a correct idea of its deleterious character. If we sink a wide-mouthed bottle—as a fruit jar—in a bucket of water, and invert it, keeping the mouth below the surface, and by the means of a tube fill the jar with air from the lungs, we shall find that a lighted candle lowered into this jar will be extinguished as promptly as though plunged into water.

This shows conclusively that air while in the human lungs is deprived of the element that supports combustion, viz., oxygen. A further test will show that air recently exhaled from the lungs will not support animal life. By actual experiment I find that a full-grown rat placed in a half-gallon jar of air just exhaled from the lungs, expired in one hour, and a rat is a hard subject to operate upon, as he is a burrowing animal and fitted to live in impure air.

This estimate makes provision for supplying fresh air to replace that rendered poisonous by breathing only. But a large addition must be made to these figures. In every schoolroom the exhalations from the bodies of pupils in the form of perspiration, the steam from impure clothing, especially when damp, the odor from bad breath caused by decayed teeth, disordered stomachs, or tobacco, oftentimes burden the air with a mass of poison scarcely less dangerous than the exhalations from the lungs. For these reasons, the most accurate and scientific estimates made by experts have placed the requirements of each occupant of a room at from 1,400 to 3,500 cubic feet of air per hour, or an average of more than 2,000 cubic feet to pupils of all ages. In an

ordinary schoolroom this will require a complete change of air every fifteen minutes, and even this makes no provision for fires that are burning in most school rooms.

It is of the first importance that the fresh air introduced into a room should be warmed before falling upon the persons of the pupils. In the majority of our rural schoolhouses there is an absolute disregard of all ventilating-appliances, except through the doors and windows. Nor is this defect confined to our country school-houses entirely. Many villages, and cities, too, have paid little or no attention to this important matter. One familiar proverb says, "As free as air," and yet there is no one thing of which we are so penurious in school architecture.

Besides the necessity of providing for the entrance of pure air, there is an equal demand for some provision for the removal of foul and cold air from the lower portion of every room. We may lay it down as an axiom, that no person, child or adult, can continue long in good health, when subjected constantly to the discomfort of cold feet, as this will cause an undue flow of blood to the head, and tends to produce cold in the head and other attendant diseases. So then, in unventilated schoolrooms pupils are subjected to the two-fold danger of poisoning through their lungs, and an unequal circulation of the blood, resulting, in time, in general lassitude, bloodless countenances, and catarrh in the head and nasal passages. The plan of ventilating by means of windows lowered from the top, affords some relief, but is attended with many objections, some of which I will name:

1. Cool air thus admitted will, of necessity come in currents and fall upon the backs and shoulders of pupils, thus producing an unequal temperature in different parts of the body, which will result in colds or rheumatism.

2. It affords little or no escape for the foul air of the room.

3. It gives a means of escape to the best, purest, and warmest air of the room, and where fuel is an item of expense, it is too costly for any but the most improvident. These defects in school architecture are sufficient in themselves to explain a large part of the premature debility so often lamented in connection with the school-life of our children. And these defects, let it be remembered, are not chargeable to the school or its course of study or discipline; they pertain entirely to the outside official management, that is often too high and immovable to be affected by any voice or petition from the teacher's desk. The true solution to the ventilation problem is to introduce fresh air in one part of the room through an opening in the floor (not breast high) warm enough for use and comfort when first admitted. In another part of the room provide an escape for the vitiated and cold air that always lies on the floor. This can be done in this way: Let the chimney of every school-house rise from the ground floor, or better, from the foundations of the house, and let it be large enough to contain two ample flues; one, for carrying the smoke and the other for ventilating purposes. Registers opening into the ventilating flue on the floor (not a foot above the floor) in every room will, if they are large enough, make a sufficient provision for removing all gaseous impurities from a schoolroom. The danger will be that all chimney builders will make too small an estimate for the dimensions of these flues. Let the workman make his estimate of the necessary capacity of the flues, and then insist that he multiply his figures by two, and work to that pattern, and a fair result will be secured.

The objection will doubtless be made here that while it is easy to introduce the fresh air warm and ready for use when buildings are heated by furnace or

steam, it is not practicable in a room warmed by a stove. The solution of the problem, even in this case, is less complicated than would at first appear. Let the stove be surrounded by a jacket of sheet iron, and let a duct for fresh air be placed *under the floor* with one end opening out doors in the outer wall of the house, and the other end opening upward under the stove. Let this inner opening be furnished with a register for regulating the flow of fresh air. In this way all fresh air introduced into the room would flow up around the stove, rise to the top of the room, and by its elasticity press down upon the cold and foul air on the floor and drive it up the ventilating flue; and the heat of the smoke-flue would also assist to make a strong draught, and thus complete ventilation and frequent change of air would be effected. A constant movement of the air would bring warmth and comfort to the occupants of the room without subjecting them to the extremes of either heat or cold. The economy in the use of fuel thus secured would in a short time more than compensate for the expense of construction.

Another fruitful source of ill-health to pupils, and teachers too, in some school-rooms, is found in a poorly laid floor, through the numerous cracks of which streams of cold air are constantly flowing. In the same category may be placed those school-houses that are built on blocks of wood with no foundation of mason work beneath. The seeds of fatal disease may be laid in many a delicate child in a single term of school. Indeed, only the most robust escape harm from such exposure. Such school-houses seem like indications of "malice aforethought" against the school children. It would be interesting, but sad, to trace the path from the beginning of fatal colds, coughs, sore throats, measles, scarlet fever, and diphtheria, and note how many of these inhospitable temples of knowledge stand in close proximity to cemeteries filled with child-graves.

These defects in our schools are not chargeable to the schools, or teachers, or text-books. But there is no doubt that they cause to many districts the most burdensome part of their school tax. One protracted case of typhoid fever will generally cost a family more than a year's schooling for several children.

In seating a school room great care should be exercised, both in relation to the hight of the seats and the distance between them. A lack of proper adaptation in either of these particulars will often result in a curvature of the spine or a displacement of the shoulders. Too great care cannot be taken by the teacher in this department of his work to secure an erect position of the child, both when sitting and when standing. The *combined* efforts of home and school are needed to prevent a depression of the chest, a constraint upon the lungs, and an unfortunate stoop to the shoulders.

Nor must I omit to notice the danger to which the eyes are subjected by an injudicious exposure to the light. Seats that face the light expose the occupants to a glare that few eyes can long endure without detriment, and multitudes of children are afflicted with weak eyes induced from this cause. An insufficient supply of light will surely produce near-sightedness or some similar disorder of vision. There is no doubt that thousands of our people suffer life-long inconvenience from one or another of these causes.

Another much neglected but by no means unimportant part of school furnishing is the water-closet. To the unthinking and unitiated this item long has had, and still may seem to have, no place in the discussion of questions pertaining to school hygiene. To those who have given the subject careful attention it is a matter of no small magnitude. Upon how many school

premises may one see a mean, dilapidated building, bearing all possible marks of disrespect and execration, as remote from the school-house as the dimensions of the school grounds will allow; difficult of approach to sensitive pupils, at all seasons of the year, on account of its publicity; in the winter still more difficult of approach on account of snow-drifts, mud, and lack of walks. We will not look within; we know that in the winter the snow sifts in at a thousand crevices; that northern blasts make it a very cave of the winds; that it is as comfortless as an iceberg; and that in summer it is as malodorous as Tophet. In some of our better regulated communities the condition of things is not as bad as indicated above; but in a multitude of places facts would justify a description as unfavorable as imagination, assisted by experience, can well paint; and in no town that it has been my privilege to visit in the good State of Michigan are the appointments as comfortable and unobjectionable as they should be,—as our girls and boys and teachers deserve. I wish to say to my fellow-citizens that, in my judgment, our people are doing themselves and their families, especially their daughters, a very great harm by a system of unwise economy. Health is cheap, even though procured at any amount of painstaking; untidiness, filth, are never economical. If there were a free and unrestrained statement of facts on the part of the more sensitive girls, the young ladies, the teachers, and some boys, too, we would have a revelation that would startle us. We should find that many check proper natural desires, from fear of publicity, till great physical harm and suffering result. Others are influenced by considerations of discomfort, such as cold, bad walks (or none at all), untidiness, etc., till many most mischievous and painful diseases ensue.

There can be no doubt that many cases of weak back, faintness, kidney disease, constipation, and others of like nature, are either engendered or seriously aggravated from this cause. My candid conviction is that, as a people, we have been criminally negligent in this thing. There is no need of being prudish, but it is just as needful that our schools should have a privy, neat, secluded, and comfortable, as that our homes should. It should be near the school-house, easily accessible by a comfortable and retired approach, and it should be tidy. A district that cannot afford a regular water-closet can have an earth-closet.

We have a saying, "As cheap as dirt." Let us use more of this cheap but excellent article for this purpose. As a disinfectant it is surpassed by few costly drugs or preparations. Every town or city that can afford a good high-school building, with cloak and hat rooms, can well affort to add one more hygienic necessity, constructed upon principles now acknowledged to be the best, so that the building may be complete in itself, and may minister thoroughly to the comfort of all its inmates.

The paper on "Meats," prepared for this Convention by Prof. Vaughan, here follows:

MEATS.

BY PROF. VICTOR C. VAUGHAN, M. D., PH. D., OF ANN ARBOR.

A large proportion of our daily food consists of material derived from the animal world. Other animals take vegetable food and build it up so that it approximates in chemical and physical properties the flesh of man. Vegetarians may put forth as many arguments as they please in their vain endeavors to convince the mass of the people that animal food should not be eaten.

Man has but one stomach, while the ox has four, consequently the latter is fitted to carry out the more complicated processes of digestion. It is simply obeying a physiological law when man allows the ox to take the grass of the fields and convert it into beef, which the man may then eat and easily digest. Indeed, the claim of being vegetarians, set up by many individuals, is to a great extent a hoax. Several times have I partaken of food at the tables of those who claimed to be strict vegetarians. They would assert that they ate no animal food. Still on their tables you will observe milk, with its products, cream, butter, and cheese, or eggs. Now, these are animal foods, just as truly as beefsteak or ham. I think that real vegetarians are very rare. If you advocate the idea that the farmer, mechanic, or professional man does not need, and indeed would be better without the large quantities of meat that men in the various callings of life consume, then I will agree with you. I have not the least doubt but what man would be much better physically, mentally, and morally, if less food rich in nitrogen was eaten. Certainly it cannot be denied that the kind of food influences greatly the physical condition of nations. A striking illustration of this is seen when we study the circumstances connected with the famines which once devastated Ireland. With the potato the Irishman lived, and when this crop failed, he died. Again, when the potato was almost the only food, scrofula and its kindred diseases visited the Emerald island every year; but since the introduction of corn into that country the people have become less susceptible to disease. We learn another lesson by the study of the gradual rise of the inhabitants of England. In that country the type of disease has changed radically, there has been a corresponding change in the food of the people. During the fourteenth, fifteenth, and sixteenth centuries, the Englishman was more brutal than human. This was partly due to his food, and partly to other conditions. The ancient baron consumed flesh almost with the same eagerness and rapidity, with which the king of the forest consumed his prey. Indeed he resembled the lion and tiger in his actions. A well-known historian says: "Bloodshed and robbery were universal; two-thirds of the country were moor, forest, or vast swamps; the houses were small and squalid, built of wood and thatched with straw, without chimneys or other conveniences; the floors without boards or bricks, and covered with straw or hay, which remained for months saturated with reeking filth; the streets of London were narrow, unpaved, filled with refuse of all kinds; the towns, and many of the individual houses, were surrounded by ditches which were filled with filth."

Take such surroundings as these, and then load the man's blood with the poisons, urea, uric acid, etc., arising from the excessive consumption of flesh, and you make him more of a brute than of a man.

Nitrogenous food is best suited for immediate displays of strength; while non-nitrogenous food is better adapted for long-continued action. For instance, in a leap of 20 feet or a run of 100 yards, the tiger surpasses the deer; while in a race of 50 or 100 miles, the deer would distance the tiger. The Englishman of the fourteenth century took that kind of food which enabled him to strike a blow quickly and with force. Brought hand to hand with his foe, and with but a club or battle-ax to defend himself, the blows must fall fast and heavy.

It is now well known that the liver as well as the stomach plays an important part in the digestion of albuminous foods; and many persons now suffering from biliousness and other evidences of a disordered liver would find themselves much benefited by limiting the amount of animal food taken.

But let us not conclude that animal food is altogether bad. Indeed, no nation can any more be great by discarding it than it can be by abusing it. Nitrogenous food, in proper quantity, is a nerve stimulant, and some of it is necessary to the healthy existence of the body. We will now briefly consider some of the most common kinds of flesh ordinarily eaten by man. These are beef, veal, mutton, lamb, pork, bacon, poultry, game, wild fowl, and fish.

First let us consider some of the general laws about the selection of this kind of food. The following statements are, in the main, condensations from the works of Pavy and Letheby.

1. The flesh of young animals is more tender than that of the old, but experiment as well as experience has shown that the former is less easily digested. For instance, veal and lamb are less easily digested and tax the stomach of the dyspeptic more than beef or mutton. The tissues of the young animal are less stimulating, less nutritious, and more gelatinous than the tissues of the adult animal. Veal contains but little fibrin, indeed so little that mastication is but partially performed. On the other hand, it is well known that the tissues of an old animal are often so very tough that they defy both mastication and digestion.

2. It makes a difference whether the special meat be served in season or out of season. Beef is in highest season in the early months of winter, after the animal has been afforded a rich pasturage. Pork is out of season during the hot months of summer.

3. The flesh of wild animals is richer in nitrogen and in flavor and contains less fat than the flesh afforded by the same species kept in domestication.

4. In most cases animals are fattened for the table. Some fat is quite essential, as it renders the meat more juicy and develops an agreeable flavor. But the process of fattening is often carried so far that the meat is rendered unfit for direct consumption. Fat should be taken in a finely divided state, for in lumps it is well nigh indigestible.

5. The manner in which the animal has been killed must be taken into consideration. Slaughtering is generally so conducted as to remove as much as possible of the blood. Either death is produced by the withdrawal of blood or the blood is withdrawn as soon as possible after death. The removal of the blood enables the meat to be preserved with more ease; it also improves the flavor.

6. Keeping an animal without food for some hours before killing it renders the meat more easily preserved.

We must now ascertain the best methods of detecting unwholesome meat. This article cannot be adulterated or falsified to any considerable extent, but it may be unwholesome. Especially will you find this to be the case if you try to get fresh beef-steak during the summer or early months of fall. The following rules may aid in selecting wholesome meat:

1. It should be elastic to the touch. Discard meat that is wet and flabby as you would a poison, for such meats have killed more than arsenic and strychnia ever killed.

2. It should not become wet or gelatinous after being kept at a low temperature for two days, but should remain dry on the surface and firm to the touch.

3. Good meat is not of a pale pink color, for such a color indicates that the animal was diseased. There can be no question of the possibility of the transmission of disease through unwholesome meat.

4. Good meat will not have a dark purple hue, for this color is evidence that the animal has not been slaughtered, but has died with the blood in its body, or has suffered with some acute febrile affection.

5. When dried at 100° C. good meat does not lose more than 75 per cent of its weight, and the best meat will not lose more than 70 per cent.

6. Good meat (beef) has no, or but little, odor, and if any odor be perceptible it is not disagreeable. In judging as to the odor of meat, pass a clean knife through it, and examine subsequently as to the odor of the knife.

7. Good meat, of course, contains no parasites.

We shall now discuss briefly the individual properties of the most common animal foods. We shall find that they present considerable variety, and that some are beneficially used in certain diseased states, while others are injurious. Much good may be accomplished by the physician in the selection of proper food, while much harm may result from a neglect of the rules of dietetics.

1. *Beef.*—In those nations most advanced in civilization, beef is the principal animal food. By common consent, we admit that beef is more nutritious than other kinds of flesh. This universal opinion is supported by the investigations of science. There is a larger proportion of nutritious material in beef than in the flesh of the sheep or hog. Beef is of a closer texture and is full of red blood juices. Its flavor is fuller and richer than that of other meats, and a smaller amount will satisfy hunger. You know that Darwin claims that the intellectual development of England is due directly to the nutritious value of the beefsteak, and indirectly to the old maids of that merry land. That far-sighted scientist reasons thus: The rich, highly-flavored, nutritious steak which is furnished in the island depends upon the red clover which grows in abundance, and forms a rich food for the cattle. Now, the growth of this clover depends upon the abundance or scarcity of humble-bees, since these bees are the means of conveying the pollen of the clover from one plant to another. Now, the abundance or scarcity of humble-bees in a district depends upon the abundance or scarcity of field-mice; for these little thieves break into the homes of the bees, steal the honey, and kill the young. Now, the scarcity or abundance of these field-mice depend upon the abundance or scarcity of cats in the neighborhood; and, finally, the abundance or scarcity of cats depend upon the number of their natural protectors, old maids.

Aside from the nutritious value of beef, there are other reasons why it forms so important a part of our food. Cattle are easily cared for, and multiply quite rapidly. They are not subject to disease to such an extent as the hog is. Moreover, the ox is made a beast of burden, and the cow yields us milk, and when the animal has been killed there is no loss. Every part is utilized.

2. *Veal.*—Calves of all ages are slaughtered in various parts of the country. In some cities, as in Boston, there is a law prohibiting the killing of a calf under one month of age. It would be well if this law, or a more extensive one, should be enforced all over the country. Veal is simply a dish to please the palate. As I have remarked, it is not nearly so nutritious as beef, and is also much more difficult of digestion. The mode of killing in this case has a special influence over the nutritious value of the food. Veal is bleached by repeatedly bleeding the animal for some days, and then at last allowing it to bleed to death. The bones of calves contain much animal matter, and for this reason they are especially valuable for yielding gelatin and chondrin;

hence calves' feet are selected for the preparation of a jelly which is a valuable food to some invalids.

3. *Mutton.*—This is more easily digested than beef, though in a healthy man no marked difference would be observed, since in the stomach of such a man there arises no inconvenience from the digestion of beef. But mutton will be found to tax the stomach of the dyspeptic less than beef does, but it must be remembered that mutton is not so nutritious as beef.

4. *Lamb.*—This should be avoided by the dyspeptic. The meat is gelatinous and is digested with difficulty.

5. *Pork and bacon.*—As a rule dried meats are more difficult of digestion than the same meats in a fresh state. Bacon, however, is an exception to this rule, as well cured bacon is digested with more ease than is fresh pork. In cold weather nice breakfast bacon is especially suited for furnishing a large amount of heat by its oxidation in the body. The inhabitants of cold countries find fatty food necessary to their existence.

6. *Fowl.*—There is no bird that may not be eaten in case of necessity. In other words the flesh of no bird is in itself poisonous. The same is true of the eggs of all birds. It is true that cases of poisoning from eating quails during the spring have occurred; but the poisoning was due to the buds of the mountain laurel upon which the quails feed. The flesh of carnivorous birds is strong in odor and in taste and would not form a tempting dish to any one. The light meats of birds are more easily digested, less rich in nitrogen and in flavor than the dark meats.

7. *Fish.*—Undoubtedly the flesh of some fish is poisonous. A fish is said to justify suspicion when it has attained a size unusual for one of its species. This popular idea may have a grain of truth in it. Fish should be discarded if the water in which it is being boiled blackens a piece of silver. The coloration is due to hydrogen sulphide, and indicates putrefactive changes. Fish may be divided into those furnishing white and those furnishing red meats. Those of the former class, as the whiting, are delicate and easy of digestion, while those of the second class, as the salmon, are richer in nitrogen and more stimulating.

Along with fish are often classed certain crustaceans, as the crab, and certain mollusks, as the oyster. The oyster consists principally of liver rich in glycogen. If the oyster is taken raw this glycogen will digest itself at the temperature of the body, while cooking the oyster destroys the ferment by which the glycogen is digested.

The president appointed Rt. Rev. Geo. D. Gillespie, Hon. H. H. Holt, and James Satterlee as a committe on resolutions, to report at the evening session.

He also appointed Wm. Oldright, M. D., Prof. E. P. Church, and O. G. Fox as a committee on sanitary appliances.

The convention then adjourned until 7:30 P. M.

FIFTH SESSION—WEDNESDAY EVENING, APRIL 12, AT 7:30.

The convention was opened with prayer by Rev. E. W. Flower of Greenville.

The first paper of the evening was on the "Disposal of Decomposing Organic Matter," by J. H. Kellogg, M. D., of Battle Creek. It is as follows:

DECOMPOSING ORGANIC MATTER.

BY J. H. KELLOGG, M. D., OF BATTLE CREEK, MICH., MEMBER OF THE STATE BOARD OF HEALTH.

MR. PRESIDENT, LADIES AND GENTLEMEN.—The subject which has been assigned to me by the secretary of this convention is a most unsavory one; a subject in which one will look in vain for anything entertaining or interesting except from a practical standpoint. The very thought of decay or decomposition is repulsive to most persons, and the presence of decay is in the highest degree obnoxious to an undepraved nature. The occupation of the scavenger, although an obvious necessity in a civilized community, is by most people regarded as a few degrees below that of the hangman. Antipathy to dirt, or at least to filth is characteristic of all the higher animals, man included. The robin takes its morning bath and carefully gleans from its feathers every trace of impurity. Many animals show distinct traces of the scavenger instinct, and keep both their bodies and their homes in a good sanitary condition by an instinctive observance of some of the most important principles of scientific sanitation. The dry-earth system of disinfection was employed by more than one class of the brute creation before it was enforced by Moses or described in any text-book on sanitary science.

Viewed from a practical standpoint, few subjects are of more consequence than the one we are considering. In an æsthetic sense it is repulsive. In a sanitary sense it is all important. The pictures which it presents to the imagination are not such as to please or entertain, but they may be such as to edify. In order to accomplish the latter result as thoroughly as possible, I shall endeavor to present the subject in untechnical terms, even at the risk of sometimes wounding the æsthetic sensibilitities of my hearers.

The decomposition of organic matter is one of the most common of everyday phenomena. The various forms of vegetable and animal life which make up the organic world are constantly passing through the change which we call death. Every living thing, from the delicate little fungus which springs up in a night and fades at the first glance of the morning sun, to the stalwart oak which braves the frosts and gales of centuries, obeys the mandate, "dust thou art and unto dust shalt thou return." Every tempest shriek is a wail of woe for the death of a monarch of the forest or a king among beasts. Every leaflet's rustle or brooklet's ripple is a requiem sung to the death of a million blooming flowers or humming insects. Every instant countless myriads of creatures in earth, air, and water fall victims to the great destroyer. The whole world is one vast charnel house. The soil we tread upon is strewn with corpses. The air we breath, the water we drink, is often teeming with the carcasses of organic beings which have finished their life work and given place to a new generation which will soon meet the same fate as its predecessors.

The universal dominance of death is often used to point a moral lesson, and with telling force it appeals to the sentiments; but to the sanitarian it has much more than a sentimental significance. Science points out with unmistakable

clearness the fact that each death is accompanied by danger to the living as well as misfortune to the victim. The chemist carefully scrutinizes the phenomena of death and discovers that when the body of a plant or animal returns to its primitive dust certain gases and other products of a noxious character spring into existence, which have the property of disseminating the cruel contagion of death so far as their influence may extend. To these, the products of decomposition, the sanitarian directs his attention.

As before remarked, chemistry brings to light poisonous gases, the presence of which is confirmed by the sense of smell; but the microscope makes a still more important discovery, viz.: The presence of myriads of minute specks of life, to which the name of germs has been attached. Wherever decomposition is taking place these organisms are present in countless numbers. It is perhaps a question whether they are a product of decomposition or its cause, but it is certain that they are never absent from the process of decay. Infinitesimal in size,—so small that millions may range with unrestricted freedom in the smallest drop of water,—they are yet more potent for harm to human life and health than all other agencies combined. Undoubtedly these are the active agencies which give rise to the terrible typhoid fever which annually carries off thousands of victims, to dysentery, cholera, diphtheria, yellow fever, the plague, and a long list of diseases, the exact number of which is not yet known.

VIRUS OF HOG CHOLERA—STAGES OF DEVELOPMENT.

ORGANISMS ASSOCIATED WITH DIPHTHERIA.

There is some difference of opinion respecting the exact nature of the germs which give rise to different diseases, and as to the exact mode of their development and transmission, but it is certainly settled that decomposing matter furnishes a fertile soil for the development of the germ-causes of the diseases mentioned, and many others.

Noxious gases and disease-germs are usually associated together: a fortunate fact, as it enables us to detect the dangerous character of an infected atmosphere without the trouble of a chemical analysis. It is possible for the air to be swarming with disease-germs without an offensive odor being present; but it seldom happens that we have an odor of putrescence without the presence of noxious germs. It is perfectly safe to say that a foul-smelling air is a dangerous air. If our eyes were microscopic, we should daily, hourly, behold sights that would appal the stoutest heart.

Perhaps we may with profit consider for a moment some of the most common sources of these deadly enemies to human life. We need not seek long for an illustration of the source from which these unseen foes sally forth to prey upon our dearest friends, ourselves. Let us picture to ourselves an average human habitation. We have a fine, commodious dwelling, ample room, plenty of comforts of every sort, every convenience that money can procure, or ingenuity devise. It would seem that the occupants ought to be

hale and hearty, but they are not. Every now and then Death makes a visit to the household, carrying off its brightest members, ruthlessly slaying father, mother, brother, sister; the strong man, or the feeble infant. Why this sacrifice, this ruthless slaughter? Who are the invisible monsters invading this happy circle? In olden times it would have been said, "an evil spirit hath done this;" but the days of witchcraft and superstition have gone by, and we must look for some more rational solution of the mystery.

Let us look around. We will begin our investigation at the lowest portion of the house, and proceed to examine the cellar. The sense of smell at once informs us that a quantity of decaying vegetables are accumulated there, having been undisturbed perhaps for months, and are pouring forth into the air deadly emanations, the effects of which have already been described. Through the open cellar-door, through small cracks in the floor, through the porous partitions, and through a thousand channels, this stagnant, poison-laden air finds its way to the living-apartments of the house, and into the lungs of the occupants. Every nook and corner of the dwelling is haunted by that pestilential, disease-producing odor.

We ascend to the kitchen. Here we find an accumulation of what everybody recognizes as kitchen-smells. In one corner stands the antiquated wood-box, the mute receptacle of a hundred things beside its daily supply of fuel. If the witnesses were not mute, we might listen to a surprising tale of sanitary transgressions connected with that homely piece of furniture in the corner. Let us turn out upon the floor the contents, and scrutinize them. Shade of Hygeia, what a smell! The nose makes protest with a sneeze. Suppress your emotions, and proceed to examine. Rotten bark, decomposing apple-cores, odds and ends of almost every imaginable eatable, the remnants of the cozy nest in which several generations of house-mice have been reared, a mouldy, putrescent conglomeration of everything perishable that enters a household, teeming with filth, redolent with putrefaction, and crawling with vermin—such are the contents of the average kitchen wood-box. Not a few such have we seen, and a still larger number, out of sight, but conveniently near, we have smelled!

In another corner is the inevitable "sink," made of wood, and saturated with decomposing "dish-water." Hiding in its secret corners are ancient rags in an advanced state of decay; and the drain-pipe connected with its bottom, affords an open channel for the ingress of pestilential odors from the cess-pool just outside the door.

The plastered walls, saturated with the accumulations of a quarter of a century, pour forth an odoriferous stream of gaseous filth, which is unobserved because overpowered by the other sources of contamination.

But we must not omit to take a peep into the pantry close at hand, before proceeding elsewhere with our investigations. I wonder if the goddess of Health ever looked into a modern pantry! If she did, it is a marvel that she did not send her emblematic serpent on a mission of punishment among the cooks, for such flagrant infractions of her laws. Our olfactories are the only guide necessary to enable us to discover the whereabouts of the precious corner where is hoarded the provisions for daily consumption by the family. An odor of sourness which betrays unmistakably the presence of decomposing milk, leads us to the doorway of the pantry, and we enter to make a closer inspection. With the exception of a few pans of milk which has lost its useful properties, and acquired some which are not useful, all looks neat and

orderly; but a musty odor, not perceptible, perhaps, to those who have become accustomed to it, but apparent and significant to the sensitive olfactories of a sanitarian, attracts our attention to sundry drawers and corners which might otherwise have escaped notice. We will not pain the sensibilities of our hearers with all the possible revelations from an investigation of the hidden recesses of the ordinary pantry. Fragments of moldy bread, stale food of various kinds, perhaps a churn, with its souring, fermenting contents, awaiting the weekly churning-day, are but a few of the items which would be included in a complete inventory. It is a magnificent place for germs of every description to hold high carnival. And they do. Every housewife knows that a pan of new milk placed in a close room or pantry with a pan of sour milk, sours much sooner than if set in a perfectly fresh and wholesome place.

Let us take a look into the sitting-room, the chief living-room of the house. Here again we are pretty sure to find a wood-box, nicely papered or painted outside, but no less uninviting inside than its humble brother in the kitchen. We find no kitchen-sink with its unsavory odors, but that source of contamination is within easy smelling distance, and so is still able to do its work of mischief. So, too, the putrescent fumes from the cellar and pantry are plainly discernible, and the walls are covered with a layer of decomposable matter condensed from the vapors rising from the cooking of vegetables, boiling of soiled garments, and other culinary and domestic operations. Many other such layers have been formed and buried by the new layer of paper and paste added every two or three years, or oftener, until, as we have seen in some instances, as many as eight or ten layers may be counted. Where could a more fertile field for germs or parasitic fungi be found?

A dark spot a foot or two in diameter in one corner marks the place where, as the housekeeper says, the paper has been stained as the result of a defective roof. A close inspection shows something more than a stain, a flourishing crop of mold. Put a speck of that same mold under the microscope, and we behold a forest. Every twig bears fine, large, round fruit, which consists of sacs filled with minute specks called spores. Some of the sacs are ripe and bursting, throwing the spores with which they are filled in every direction. This is what is taking place on the wall, and those same spores fill the air in every direction, getting into the dough and making the bread sour, creeping into the fruit-cans, stealing into the pantry, and spoiling the labor of the housewife in a hundred ways, besides creating a musty odor which is constantly inhaled by the occupants of the house, and possibly conveying to them the seeds of

GREEN MOLD.

disease and death. A beautiful carpet upon the floor conceals beneath its delicate shades a conglomerate accumulation of contributions from every source of impurity within the dwelling and without. Let the children romp about the room a few minutes, and see what a cloud of witnesses arise to testify that the shades of death are lurking just beneath its graceful patterns. Every day in the year this Pandora is compelled, by a vigorous application of the housewife's broom, to send out its miscellaneous store. Each sweep of the broom sends up a cloud of germs, and spores, and decomposing and decomposable fragments, garnered from the kitchen, the yard, the street, the gutter,—a thousand sources,—until the air becomes almost as opaque as the densest fog. Every living occupant of the room prudently retires—even to the household cat—except the sweeper, who plies her broom with industrious activity, with head and nose enveloped in the folds of a handkerchief, to act as a protecter and a strainer. When the commotion is ended, the dusty filth settles upon the tops of book-cases, cupboards, and other articles of furniture, among the folds of lace window-curtains, upon the ceiling and walls of the room, and wherever it can find a lodgement. Pretty soon our housekeeper comes back, and with a duster stirs up anew the dust which has settled upon tables, chairs, window-sills, picture-frames, and other articles within easy reach, driving it up to higher lodgement, from which it is destined to be constantly swept by currents of air, movements of windows, swinging of hanging articles, and in various other ways, to be breathed, after all, by the daily occupants of the house, who thought to escape by avoiding the commotion created by the morning's sweeping. Such air, like the mines of Nevada, has "millions in it," all alive, and ready to develop, in a fertile soil, into disease and death.

But we have not seen all yet. Here is the parlor, with its close, fusty smell, and its chilly dampness. An "odor of sanctity" pervades the place. It is sacred to use on great occasions, when its death-dealing walls are made to witness the still more deadly depredations of a fashionable festival. Upon its cold walls are condensed the steam from kitchen and washroom, and the organic filth carried with it. "What makes the walls of my parlor sweat so?" has been asked me many times by housekeepers who were annoyed by the dampness of their parlor walls and ceiling, often giving rise to mold and mildew. The explanation is already given. The sunshine never gets into this sacred corner of the dwelling, or at most only a glimmer now and then. Its walls are never disinfected by the sun's full, warm rays. Hence its air is constantly charged with death-dealing properties, which are ready to exhibit their potency whenever a favorable opportunity affords.

And there is the parlor bedroom, a veritable man-trap, containing all the dangers enumerated for the contiguous apartments, and more. How many a useful clergyman has been sacrificed in the very midst of his usefulness by incarceration in one of these sanitary—well, I came near using a very significant word, but one not a whit too significant to express the utter unfitness for occupancy by a human being, of the average parlor bed-room.

How many an itinerant missionary has arisen from his bed after a night spent in such a place, with rheumatism or consumption fastened upon him. I can easily recall many horrible nights spent in such a place, when boarding round as a district school-teacher, fifteen or sixteeen years ago, and shudder at the recollection.

Let us ascend to the upper part of the house. Here, you may say, we shall find a better condition of things. No kitchen with its foul smells, no pantry

with its decomposing food, less dust, and no woodboxes; but we must not congratulate ourselves too soon. Here is an open stairway in direct communication with the lower rooms; and the heated air from below, which ascends to the apartments above, carries with it its gleanings from cellar, sink, pantry, dusty carpets, moldy walls, fermenting wood-boxes, and the various contributions to the insanitary condition of the house, so that the upper rooms become a receptacle for the overflow from below. Closets, garrets, and unventilated rooms above become, in time, charged with most virulent enemies to health.

We have not yet by any means finished our indoor inspection, but we must hasten, so let us take a hasty survey of the exterior.

Before we pass to the outside let us pause a moment to ascertain, if possible, the cause of that peculiar sickening odor, which seems to emanate from the hall. The occupants of the house say they noticed a bad smell there last fall, and now, as the warm days of spring are coming on, it has reappeared. What is it? Each member of the family has sniffed it, and scolded at it, and echoed "what is it?" a hundred times. It is not moldy walls nor foul wood-boxes; gas from the sink-pipe, nor decaying vegetables in the cellar; sourness from the pantry, nor ancient dust from under the carpet. Possibly it may be something under the floor. No one has ever taken the trouble to look and see, as the space under the floor is not spacious enough for one to visit without considerable inconvenience, and so the matter has not been investigated. Besides there is no ready means of access to the enclosure except by making a hole through a stone wall. Suppose we step outside and undertake the task. What do we find? Perhaps a dozen rats who were fed arsenic in the cellar or pantry, and sought out this as a convenient place to die in; or may be maliciously thought to retaliate for their own poisoning by poisoning their destroyers. Perhaps the pet rabbit which so mysteriously disappeared a few months ago, apprehending approaching death from surfeiting, has sought this secluded spot to breathe his last, as evidenced by his decomposing remains. At any rate there is great need of the services of a scavenger, and we wonder how it would be possible to invent a more ingenious contrivance for accomplishing the physical ruin of a family, if such a fiendish design were to be executed.

VIRUS OF FOWL CHOLERA, WITH OVAL BLOOD-CORPUSCLES OF THE FOWL.

DESTRUCTION OF BLOOD-CORPUSCLES BY BACTERIA.

Now let us glance around a little. The front yard is orderly and inviting, of course. Graveled walks, a smoothly-cut lawn, a few elegant shrubs and evergreens, all suggest the highest degree of neatness and good taste. Let us step around to the back yard. What a contrast! Close by the door stands a garbage-barrel which testifies to at least two of the senses that its history goes far back into the dim past. Once a week the milkman comes with a cart and empties the unsavory receptacle, stirring to the bottom its reeking contents. Let me whisper in parenthesis that some of the same comes back in tin cans and earthen jars. Swill-milk is not an unknown article, even in rural dis-

tricts, where hay and grain bring a good price. At all hours of the day and night this half-rotten receptacle of decomposing organic matter sends out upon the air its filthy emanations.

Near by is a brown looking spot of earth, over which are crawling eagerly myriads of the first insects of the season, and from which ascends a noxious vapor, visible in the cool morning air, and not difficult to disoover, if not visible, by its pungent, nauseating odor. This, the gardener explains, is the dumping-place for the dish-pan and the wash-tub since the drain-pipe became clogged, a few months ago. Frozen up during the winter, it was annoying only by its unsightly appearance; but now that the vernal sun has come, the accumulation of months send forth a constant stream of noisome smells, which are too often experienced to need further description.

A rod or two from the house we notice a little depression in the ground. This, we learn, is the location of the cesspool. The boards which once formed its roof have rotted away, and allowed the overlying earth to drop into the receptacle beneath, which originally consisted of a bottomless box or barrel, half-filled with stones, and connected with the kitchen sink by means of a long wooden box. The wood has now nearly disappeared, a few rotten fragments only remaining. Out of this putrescent hole arises a stench which finds no counterpart elsewhere than in a similar contrivance for domestic poisoning. Horrible, nauseating, loathsome, are faint words to describe the dense vapors which ascend from this repository of liquid filth.

A few feet distant is an edifice which we are at a loss to know how to describe. A correspondent was in the same predicament when he sent us a clipping for publication which he said was "rescued from a place consigned to infamy." The edifice referred to probably ought to have been consigned to infamy, if it had not been, and the same should be said of most others of the same class. Though carefully guarded from observation by a close lattice, covered by clambering vines, its presence is easily detected, and that without close proximity. How often, as we walk along the streets at night, does the air, which heaven sends us pure, sweet, and potent with life-giving energies, come to us laden with the poisonous exhalations from dozens of such sources, and freighted with the agencies of death. The vault of an out-house often becomes a much more dangerous enemy to human life than a powder-magazine, or a nitro-glycerine factory; yet the latter are by law required to be located far apart from human habitations, while the former is tolerated in the closest proximity to human dwellings, often even under the same roof with human beings.

In the midst of all these sources of the most dangerous filth is located the well, from which is to be daily drawn one of the most essential of the necessaries of life. Is it any wonder that the cup of life is often transformed to the cup of death? Only think of the condition of a family with death enthroned in the well, and daily dealing out his poisonous draughts to its members! The mysterious Providence which deprives a family of its loved ones through the agency of typhoid fever may, in a majority of instances, be proved to be a mysterious connection between the well and a privy-vault or cesspool.

A settler in a new country generally digs two holes in the ground after erecting his humble cottage. Into one goes all the filth and offal; out of the other comes all the water for family use. These holes are usually so near together that the contents mingle, so that what goes into one comes out of the other. In an old settled country a man, in making a home, digs two or three holes for filth and one for water, so that the latter is often surrounded with

the former. As most of the water from the well is returned to the holes for the reception of filth, a very large share of it may find its way back to its original source. A very economical arrangement when the water-supply is short, so far as the water is concerned, but not to be recommended if health and long life are valuable.

If we inquire the location of the cistern we shall very likely find it under the house, and conveniently near the drain pipe, so that in case of leakage of the pipe, the foul water from the sink may find its way with the greatest facility into the cistern.

At no great distance we may find a stable, with its filthy accumulations, which are drenched by every rain, and contaminate the soil for many feet around, and to an unknown depth. Here is another probable contributor to the water-supply. We have seen scores of wells located in the barnyard, so as to be convenient for watering the stock, but used for culinary purposes as well, if not in any other way, in the form of milk, beef, pork, or mutton.

Some one may say the picture is highly colored; but the experienced sanitarian will certainly say we have not told half the truth. If our eyes were microscopic, we should see about us in many of the houses we visit, — perhaps in the very ones in which we reside, — a spectacle more surprising than that which met the gaze of the man of old whose eyes were opened for a moment, enabling him to see a mountain covered with armed hosts who were invisible to his natural eyes. But the hosts we should see would not be an army of brave soldiers coming to our rescue from disease and death, but the emissaries of death in countless numbers, intent upon our destruction, ready to pounce down upon us at the first favorable opportunity, rack us with pain, and finally devour us.

But what do we know about these germs you talk so much about, says one. Is not this all an hypothesis like the Darwinian theory, or the nebular hypothesis that has now and then a missing link in its chain of evidence? We answer, the connection of germs with the phenomena of decay and disease is something more than an hypothesis. A germ is not an hypothetical thing, like the ether of physical science. Germs have been seen, studied by the aid of powerful microscopes, with the greatest care. Their species, modes of development, favorite habitats, and the conditions essential to their existence have been worked out with almost as much completeness as the same points with reference to the most common of our higher animals. They play an important rôle in the cycle of existence. Without their agency the world would soon be covered with the dead but not disorganized carcasses of the millions of animal and vegetable forms which die each instant. It is the function of some of these infinitesimal creatures to reduce back to an inorganic state animal and vegetable forms which have performed their part in the world and are no longer of service. The moment an animal or a vegetable dies, even before the last agonies are over, these invisible scavengers begin their work, and their labor is carried forward untiringly until completed. This is what we call decay or decomposition. Without germs there would be no decay. Seal up a decomposable body hermetically, taking care to exclude every germ, and it will keep as long as the receptacle lasts without the slightest taint. This is what the housewife endeavors to do in the process of fruit-canning. She boils the fruit to destroy the germs it contains, and puts it in the cans while it is yet hot. If the work is well done it is a success, but if one little germ escapes destruction the labor is in vain.

These same germs are helpful, as in the raising of bread. In destroying a

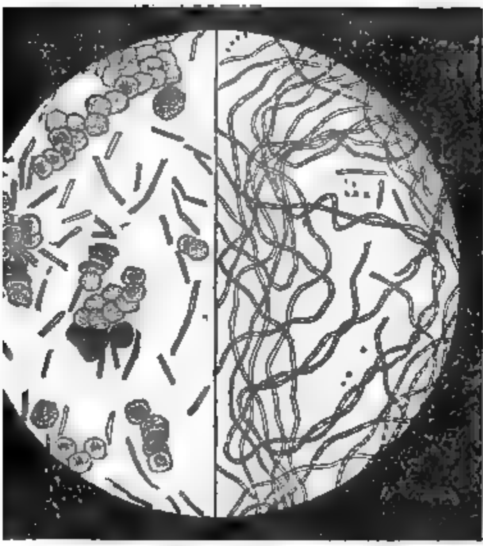


Fig. 1.—Bacteria of Charbon.

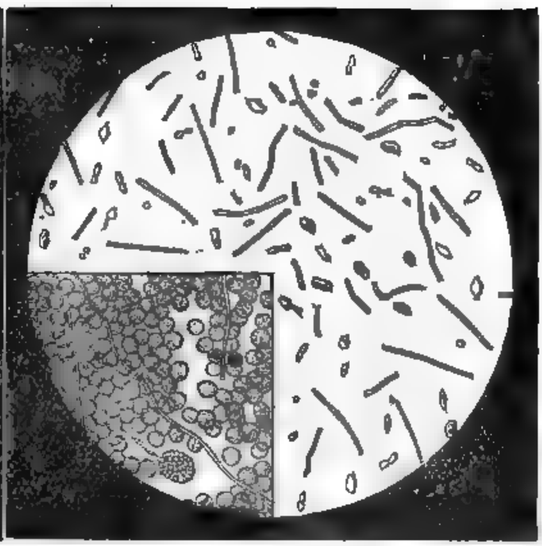


Fig. 2.—Septic Vibrios.

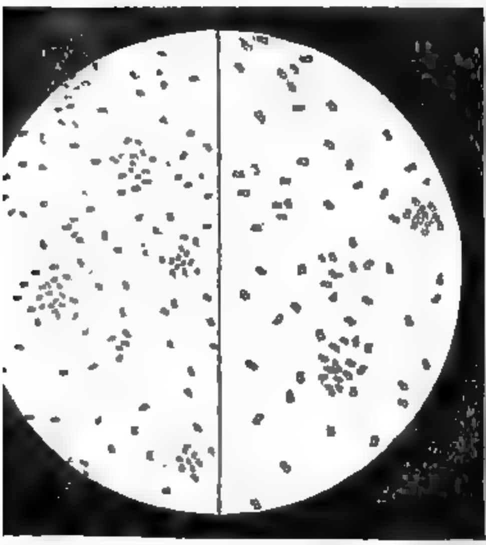


Fig. 3.—Microbia of Chicken Cholera.

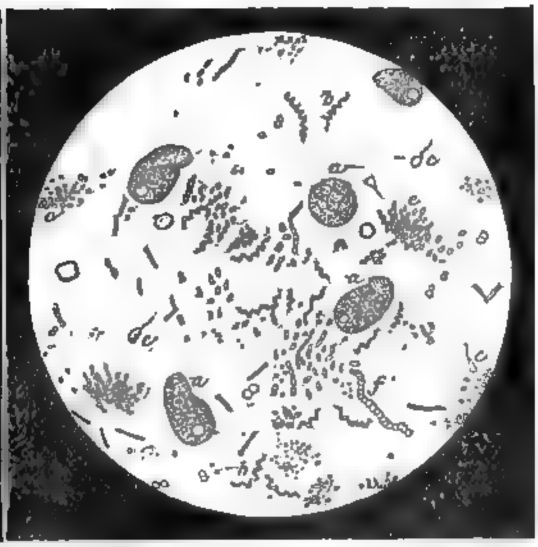


Fig. 4.—Organisms in Infusion of Hay.

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the plates for Figs. 1, 2, 3, and 4, on this page, we are indebted to the Scientific American.

portion of the starch of the flour they occasion the evolution of carbonic acid gas, which in rising through the dough makes it light. They are in one sense friendly, since they are the instruments for the removal of a vast amount of dead and useless material which would otherwise soon bury us by its rapid accumulation. Wherever decomposition is taking place these germs are present in prodigious numbers. One evidence of this is the presence of large numbers of flies in the same localities. The common house-fly subsists largely upon these same germs, as well as upon the same kind of food as their microscopic congeners. Have you ever watched a fly or hundreds of them on a summer day swarming round and round, apparently without any particular end in view. I used to wonder why the little creature should spend its time so aimlessly. The reason is readily found. Catch and kill one, if your conscience will permit you, and put it under the microscope. Observe its wings. These filmy objects when magnified present a formidable array of spikes and needle points. Here and there among them are some of the very germs which we find in the air, in water, in decomposing matter. Now let us dissect the insect and examine the contents of its stomach. Here also we find great numbers of those same germs. Now let us watch the little creatures again. Here is one which has been soaring about and now alights, apparently to rest upon the window-pane. Watch him a moment. Now he is standing on the forward four of his six legs and is brushing his wings with the hinder two. He brushes a few seconds, then rubs his feet together, then brushes again and again rubs his feet, then passes something from one hind foot to the middle one, then to the front foot of the same side, then rubs the two front feet for an instant, brings both feet to his mouth and repeats the process. Now he is brushing his head in the same way. Do you suppose he is making his toilet? Quite a mistake. The fly is not so fastidious as to spend so much time over his appearance. He is making a meal of germs. He prefers them raw and takes them alive. He soars around until his wings are loaded, then rests upon some object while he scrapes them together, rolls them into little balls, and makes a meal of them. Every time you see a fly going through such antics think of germs and hunt around for the hot-bed where they are propagating. Don't kill the fly, don't catch him in traps, don't cheat him with paper spread with sweetened pitch. Let him live. He is one of our best friends. He is a sanitary sheriff with a commission from the Creator to arrest and devour these agents of disease and death when they get into our dwellings. (This does not apply to horse-flies, blue-bottle flies, nor musquitoes.)

Germs differ in their relations to human life. Some are innocent, some dangerous under certain conditions, others dangerous under all circumstances. And there are some grounds for believing that those which appear the most innocent, and are such under ordinary circumstances, may, under favorable circumstances, become most formidable enemies to human life and health. For example, Drs. Wood and Formad, of Philadelphia, two experts employed by the National Board of Health to investigate the nature and causes of that deadly disease, diphtheria, after many months of close investigation, have submitted their report on the subject, which has recently been published in full by the Board. From this report it appears that one species of the germs known as *bacteria*, which abound in the air where decomposition is abundant, and which are on this account almost always to be found in the saliva of the mouth, may under favorable circumstances give rise to diphtheria, thus accounting for the frequent spontaneous appearances of the malady. None of

us have forgotten the terrible epidemic of this dread disease, which occurred at Ludington, in this State. Ludington is a center for the lumber trade, and a vast amount of sawdust is produced there. In speaking of the town and the epidemic, Drs. Wood and Formad, in their report, call especial attention to the fact that the third ward of the town, that in which the disease appeared, is built upon a swamp, which has been filled largely with sawdust. "The drainage is so bad that in many places a hole dug a couple of feet in the ground soon fills with water; and only in a small percentage of the houses has any attempt been made to construct cellars." In this region, diphtheria made its appearance, and spread with such thoroughness that it is said scarcely a child escaped, and about one-third of the children died. In the face of such a terrible fact as this, who will venture to say that decomposing saw-dust is not a nuisance, and a dangerous enemy to health?

Some years ago Dr. Brewer of New Haven, Conn., made some experiments on the decomposition of wood, many of which we have verified. He found that sawdust, when wet, very quickly undergoes putrefactive decomposition, the process continuing for years, if the wood is kept moist. While undergoing this process of decay, it swarms with the very same variety of germs, or bacteria, found in the throat in diphtheria, which are undoubtedly given off into the air in great numbers. The same is true of any accumulation of wood exposed to dampness, as wood-piles, not covered, heaps of chips, wooden side-walks, pavements, etc.

But we must now come to the practical question, What shall we do with this decomposing matter? Its constant occurrence is unavoidable. How can we so dispose of it as to avoid the dangers which have been no more than hinted at in this paper? This question is not a modern one. It was asked and answered, and correctly, too, more than three thousand years ago. Moses understood the disinfecting properties of earth. The city of Jerusalem was provided with sewers. Rome, when in its glory, was well provided for in this direction. The same may be said of Carthage, Nineveh, Alexandria, and Herculaneum. During this period no great plagues prevailed, except in consequence of famine and war. During the dark ages, this branch of sanitation was neglected, and great plagues occurred, which again and again nearly depopulated whole countries. In modern times a revival of sanitary measures has put a check upon the terrible ravages of cholera and the black death, and we scarcely need fear a repetition of the scourges of the middle centuries of our era.

We have not the time, and this is not a fitting occasion for a dissertation upon sewerage; nor can we stop to even mention the numerous plans which have been adopted at different times and in different countries, for disposing of organic matter. I shall confine myself to the consideration of the best methods for use in a city without sewers, in small towns and villages, and in the country. The disposal of human excreta is the most serious and important part of the problem. How may it be accomplished, safely and inexpensively?

First, and most important, we mention disinfection? A disinfectant is a substance which, when brought in contact with decomposing or decomposable matter, destroys its dangerous properties, and thereby renders it innocuous. This is accomplished by the destruction of the germs associated with it, if in a state of decomposition, and by a chemical action upon the decaying substance. All excreta should be disinfected with as little loss of time as possible.

What are the best disinfectants? Dry earth, coal ashes, charcoal, and

saturated solutions of the mineral salts, as the sulphates of iron, copper, and zinc, commonly known as copperas, blue vitriol, and white vitriol; chloride of zinc, and permanganate of potash, or of soda. Each of these has its excellences, but copperas, the cheapest of all, is also one of the best, and will be most often employed on account of its inexpensiveness. Permanganate of potash is particularly serviceable for household use, especially in the sick-room. Its solution has a deep purple color, which disappears as its disinfecting properties are utilized, thus enabling us to assure ourselves as to the completeness of the work, as I will illustrate by a simple experiment.

The jar which I hold in my right hand contains a solution of permanganate of potash, and is, as you observe, of a deep purple color. In my left hand I hold a jar containing a solution of organic matter in a state of decomposition. Now I will add to the contents of this jar a small portion of the purple solution. You observe a slight purple tinge which quickly disappears as the solution is stirred. As I continue to add portions of the disinfecting solution the purple color disappears less and less readily until it remains permanently. Now we know that the solution of decaying matter is fully disinfected and is no longer capable of doing harm. A quantity of this purple permanganate solution ought to be kept on hand in every househould ready for use in disinfecting the discharges of diphtheritic and fever patients.

This same agent, by the way, affords a very good means for determining with a tolerable degree of certainty the character of drinking-water with reference to the presence or absence of organic matter. The test solution is very easily made and used. Obtain of any druggist twelve grains of caustic potash and three of permanganate of potash. Dissolve both together in an ounce of distilled or filtered soft water. Add one drop of this solution to a glass of the suspected water. If the color disappears at once add another and continue adding until the color remains for half an hour or more. The amount of the solution necessary to secure a permanent color is a very fair index to the quality of the water. If the color imparted by one or two drops disappears at once the water should be rejected as probably dangerous. I have been looking around your city for specimens of bad water, which I find there are ample grounds for suspecting on account of the porous nature of your soil, and I was rewarded by finding a specimen which I will exhibit to you. You will notice that as I add the test solution the color disappears rapidly, and a large quantity is required to produce a permanent color. This is very bad water, yet it has been very freely used, and we wonder that it has not been the cause of much sickness. It is very possible that many cases of mysterious illness might be fairly attributed to this source. I will not give the location of the well from which this water was obtained, but would advise each of you to obtain a supply of the test-solution and examine your own.

Sulphuric and sulphurous acids, together with nitric and muriatic acids, are also good disinfectants. Chloride of lime, if properly used, is also very cheap and serviceable; but as commonly employed it is of no service except to quiet the conscience of the user by producing what might be termed "a sanitary smell." Carbolic acid is also of no value when used in the ordinary way, and to be useful must be employed in such quantities as to make it very expensive. Bromo-chloralum owes its disinfecting properties to the chlorine and bromine which it contains, and is useful if employed in sufficiently large quantities, which its high price is likely to prevent.

How shall we use these disinfectants? We will give a few hints on this point as concisely as possible.

Dry earth and coal ashes are best used in the earth-closets, which may consist of an ordinary closet with a box of earth and shovel convenient for use, or of a closet to which is attached any one of the numerous mechanical devices for applying the earth or ashes.

The following points must receive special attention: The earth must be dry and it must be fine, and must be used in abundant quantities, sufficient to absorb all the moisture, as it is by this means chiefly that dry earth is useful for this purpose. Coarse sand is of little value. Clay, dried and pulverized, is the best of all materials for this purpose. Charcoal, finely pulverized, is useful when applied in abundant quantity, both as an absorbent and by means of its oxidating properties. It may be used in the same way as dry earth. It must be used in large quantity, sufficient to absorb all moisture.

Copperas and the other salts mentioned must also be used freely, if any benefit is expected from them. A solution of copperas, containing at least two pounds to the gallon, should be kept on hand for use. At least a pound of copperas, in solution, should be used each day for a family of ordinary size, or about an equal quantity of blue or white vitriol. When purchased by the quantity, copperas costs but a few cents a pound, and hence may be used freely at small expense.

We need not particularize further respecting the use of other disinfectants, except to remark that in cases of illness from typhoid fever, diphtheria, or any other infectious disease, the discharges of the patient should be received directly into a saturated solution of copperas or sulphate of zinc, or a strong solution of permanganate of potash or soda. White vitriol has the advantage for sick-rooms that it does not stain or discolor garments with which its solution may come in contact.

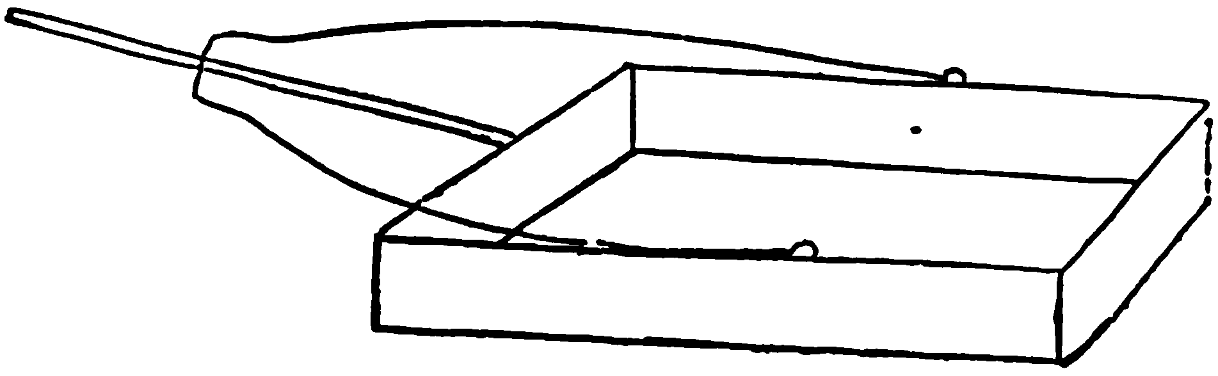
But what shall we do with our decomposing matters after disinfection? They should be removed as speedily as possible to a considerable distance from any human habitation, particular pains being taken to avoid the vicinity of wells or springs. We recommend, above all other plans, for use in rural districts and small towns, the earth-closet system in some form or other. A vault cannot be made safe from danger of contaminating the water-supply unless made water-tight, and then would still be a source of air-contamination unless a large amount of some good disinfectant were daily employed. If tight at first, it would soon leak, and the disinfection will seldom be attended to.

The dry-earth system is safe, practical, and economical. The great requisite is coöperation. A man may keep his own premises in a scrupulously sanitary condition, and yet be as much endangered through the carelessness of his neighbor as though he was himself equally regardless of the requirements of sanitation. "Thou art thy brother's keeper" applies with all its significance in a sanitary sense.

The dry-earth system has been very largely used in a number of European cities, and somewhat in this country, and its practical success is thoroughly demonstrated.

In the spring of 1875 I introduced this plan into a small city in this State. About one hundred receptacles were put into use. Dry earth and ashes were employed to delay decomposition, and a scavenger was engaged to empty the receptacles once a week during the months of April, May, June, September, and October. They were regularly emptied twice a week during July and August, and during the most extreme heat of those months every other day. The results of this small effort were very gratifying, the usual amount of summer

and autumnal sickness from fevers and other zymotic diseases in the section of the city in which the pans were introduced being greatly lessened. The receptacles employed at that time were shallow pans about two feet square and four inches deep, made of heavy sheet-iron, and costing about sixty cents each. It was found that the constant contact of a greater or less quantity of fluid excreta occasioned so rapid corrosion of the iron that the pans were rendered useless after one season's use on account of leakage, so that the system was not continued by all who at first engaged in it, though many provided themselves with galvanized pans, which were more durable, and a few made large tubs by dividing kerosene oil barrels, to which a long stout handle was attached, by means of which they were drawn out to be emptied and replaced. Four years later an effort was made in the same community to introduce the "pail-system," most of the pans being worn out or abandoned for want of appreciation of their value. Though the effort was made quite late in the season, owing to inability to give the matter attention earlier, a large number of pails were introduced. The size of the pail used was 12x15 inches at the top, 9 inches at the bottom, and 10 inches in depth. They were made of heavy galvanized iron, were very strong, and cost 50 cents each with the collar, which is attached to the seat to prevent the scattering of excreta upon the ground. The width of the collar is varied somewhat according to the distance from the seat to the pail, this provision being made to accommodate the plan as much as possible to the form of construction found in most buildings. The pail rests upon a plain board upon which are fastened guides which direct it to the proper position.

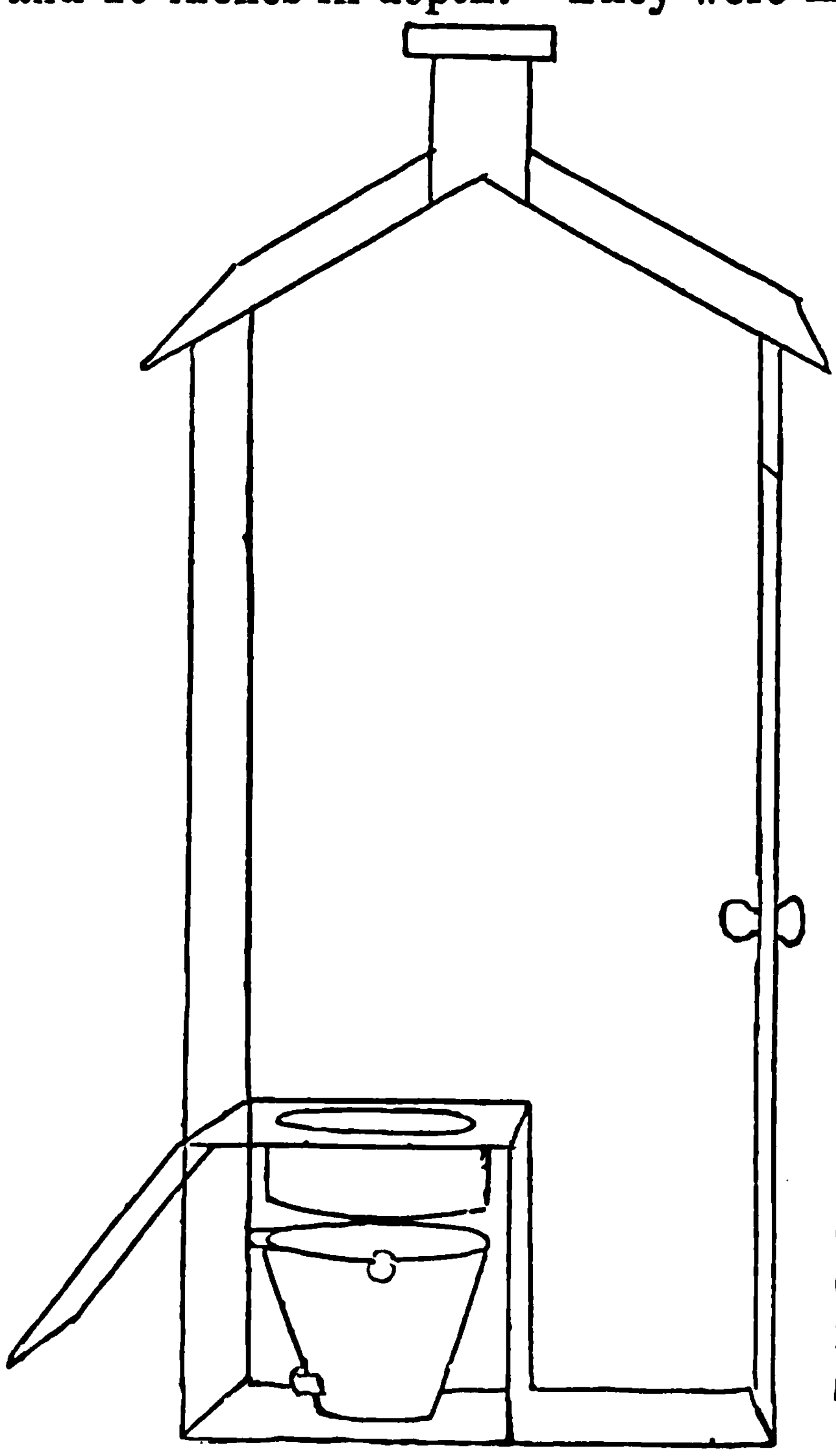


PAN FOR DRY-EARTH CLOSET.

The pails are managed upon the same plan as were the pans, and prove in every way much more satisfactory, being more durable and much more convenient for handling by the scavenger. The expense of this system is very small. The original cost is a mere trifle, and when a hundred pails or more are in use, the expense for a scavenger was five cents a week for each.

This system has been kept up to a very considerable extent where it was introduced. The great obstacle in the way is the apathy of the people to the necessity of giving attention to this matter.

Another advantage of this system, which we have not mentioned, is the fact



PAIL FOR EARTH-CLOSET, IN POSITION FOR USE.

that the removal of the excreta is not at all offensive. The work of the scavenger, usually done at night, is in our opinion often a cause of spreading disease. An odor so strong as to awaken one from sleep in the early morning hours is certainly capable of further mischief.

But there are other forms of decomposing matter. What shall be done with the garbage? Combustion is a good means of disposing of such filth, and relieves the scavenger of an additional burden, and the milkman of a temptation to economize. Fire is the most certain of all disinfectants. This plan is not nearly so troublesome as some may think. If not burned, the garbage can be treated in the same manner as excreta. Washwater and dishwater should be carried out and distributed over the soil several rods from the house. Do away with the cesspool and the vault, and you will abolish two-thirds of the mortality from typhoid fever, diphtheria, epidemic diarrhea, and dysentery, and perhaps a number of other diseases. Abolish cellars under houses and place the house high enough to allow of free ventilation and thorough and frequent inspection of the area beneath.

Exchange carpets for hard wood floors, well oiled, and covered, so far as necessary or desirable, with loose rugs which can be daily removed and shaken. Never allow dust to accumulate anywhere in a house. Banish wood-boxes from the living room. Never paper a wall over another paper. Let in the disinfecting sun-beams and plenty of fresh air to every room daily. Never mind if the carpets do fade; better the carpets than the faces of our wives and little ones. In short, *keep* clean. Keep your premises clean, your dwellings clean, your bodies clean, and your hearts clean, and decomposing organic matter will never do you any harm.

J. H. KELLOGG.

[By means of a stereopticon a number of views were thrown upon a screen, which were designed to illustrate the facts presented in the paper and to impress them upon the minds of the audience.]

This paper was followed by one on "Relation of the Church to Sanitary Reform," by Lemuel Clute, Esq., of Ionia. It is as follows:

RELATION OF THE CHURCH TO SANITARY REFORM.

BY LEMUEL CLUTE, OF IONIA.

In what I say of the Church on this subject, I shall speak of it as one of the educational institutions of the age. As such, it should do all it can to make people healthy as well as moral. In fact, good health is largely conducive to morality; and morality becomes the substance of religion when it is the result of the study of law, and a deliberate observance of right as the law teaches the right.

There can be no trifling with sanitary laws; we must observe them or suffer the consequences. But no one likes to suffer. Every person prefers health to sickness, being happy to being unhappy. How is it, then, we see so much sickness—why so many die young? Why, all about us do we see people living in plain violation of sanitary law. Manifestly they do not think about such law; it has not been explained or suggested to them. To prevent sickness we must understand its cause; but the cause of sickness has heretofore been little known. Much of it, by the Church, has been passed as the result of some mysterious Providence. A beautiful, good little child dies; no apparent cause is seen; tender, anxious parents have watched over it; yet it goes, and to account for it we are told the ways of Providence are mysterious and past

finding out. The real cause may lie upon the surface of sanitary law; the offspring of parents, it may be, whose physical constitution rendered it impossible to have other than a puny babe. Before marriage they were Sabbath-school scholars and members of the Church; but no warning word ever came from the pulpit indicating that it would be a grievous sin—a violation of law—for those to have children who transmit to them a fatal disease. We build pest-houses and enact strict sanitary laws to shield the living; but prenatal protection, the unborn innocents, are left to chance and the unrestrained lust of a half-developed race. A great number of those who are sick or infirm inherit their infirmities. Take the question of deafness, and the most obvious cause is the consanguinity of parents, and hereditary transmission. Dr. Bemis, of Louisville, Ky., who has made a special study of the causes of deafness, tells us that from 833 consanguineous marriages, producing 3,942 offspring, 1,134 were defective in the physical organization, and 145 were deaf and dumb. He estimates that full ten per cent of the deaf in the United States spring from kindred parents.

We know how the law of transmission is with animals; it is precisely the same with man. Ought there not to be as much care to have healthy children as stout, well-built colts? But what has the Church to do with this? How can the pulpit change the laws of nature? I do not expect any change in nature's law; only I suggest that, knowing the law which regulates the transmission of disease, the Church should do what it can to teach the law—instruct and warn people against violating it.

If you go to have your photograph taken you will note with what care the artist prepares his plates and arranges everything in the most exact accordance with the law regulating the taking of sun-pictures, before he removes the cloth for the impression to be made. He understands that to have perfect pictures everything must be in precise accordance with law. Every neglect of his leaves a blemish on the impression taken. Then how can the minister expect the truth to make any real, lasting impression on human minds that are not prepared to receive it? The photographer might as well leave out the use of chemicals and all exact preparation of his plate, as for the pulpit to expect the best results from preaching in a foul atmosphere to people who have all they can do to sustain respiration and life.

A few years ago I heard a sermon from this text: "Blessed are the pure in heart, for they shall see God." The minister was talking to a large audience, on a cold winter evening, in a room heated by a hot-air furnace. The furnace was too small to heat the space required, and consequently the janitor kept it running to its utmost capacity. The cold air passed in to the warm-air chamber through a box which ran to a cellar window near the surface of the ground, where all that is foul in the atmosphere will float and be sure to enter any such draft as the pipe or box presented. This fresh (?) air was passed in over the red-hot tubes in the air chamber, where, owing to loose bolt-heads and cracks in the castings, it mixed freely with the gases from combustion, and being thus mixed and burned, so as to be well-nigh worthless for breathing purposes, it passed into the audience-room for human use. The ventilation was such that the atmosphere was sickening; the gas burned dimly, and the audience made every reasonable effort to keep from acting stupid. All seemed to feel thoroughly disagreeable and anxious to be free. Yet in such an atmosphere—foul, filthy, unhealthy—the minister talked about the pure in heart seeing God. How thoroughly unphilosophical to suppose that if there were any "pure in heart" present, they would not at once, on discovering its con-

dition, leave the room. Or to think that the impure in heart could possibly be made better thus surrounded. A room so full of poisoned air illustrates the need of sanitary thought in the Church. In a small room I frequently see a class meet, in Ionia, to converse on religious matters. With closed door and windows the members will sit for an hour talking on religious subjects, totally oblivious of the sanitary fact that the air in the room is unfit for respiration in five minutes after their meeting begins.

Now, would it not be well for the Church to teach the elements on the subject of warming and ventilation? Is it not, religiously speaking, of vital importance to the cause of religion, to have the people clean and healthy? Can people think clearly and appreciate a good sermon when surrounded by a filthy atmosphere—often so bad that life would not be safe after a protracted session. It will not do to say that home and school education should correct this. The Church itself must be the school wherein such knowledge is gained as will preserve and keep a pure healthy atmosphere around those who attend its sessions. Two weeks ago a man left the Sabbath-school at M. E. church in Ionia, saying, "I cannot stand that; the atmosphere is perfectly terrible."

So upon the subject of temperance, directly connected as it is with both the questions of health and morality, how important that the Church should be right. Happily, theoretically, it is now mostly right; but there is room for a vast deal of growth in the Church in a sanitary way in the matter of temperance. Much talk we have from the pulpit in regard to belief. Well, it is a good thing to believe right, but far better to do right. I have no recollection of hearing but two ministers denounce, in an earnest way, the habit which is now so ruinous, of using tobacco. Rev. G. S. Barnes, who used to be here, made an earnest fight against it when in Ionia, and thereby wounded the feelings of some very good men, "professing," yet chewing and smoking as vigorously as though the minister had commended the practice. And now we have in Ionia a right royal preacher, Rev. Mr. Gardner, who does not hesitate to condemn, and by unanswerable arguments show his reasons for condemning the use of tobacco. Only a few Sunday evenings since I saw one of his members rise, and with indignant stride and wounded look, leave the church as the minister began on the subject. He had chewed and smoked so long that his system was full of the weed, and his mind poisoned with the idea that the minister had better not be so personal. If he wanted to denounce sin he must content himself with a tirade upon Judas, or some poor erring Jew who, with all his friends, for centuries have been dead and so past all danger of having their feelings hurt if their sins are discussed.

What must be the sanitary condition of that man's soul who cannot, with all his heart, condemn the use of tobacco, even though he may have unfortunately become a victim to the habit? To-day it is questionable whether rum is doing more evil in the land than tobacco. One of the strongest objections I have to overcome in urging my boy to shun its use is the idea that many good men in the Church smoke. And the sanitary, moral, and spiritual law, as by the Church interpreted, permits them to so do, and still be members in good standing of the organization. By every principle of right the Church is bound to so instruct its members in sanitary law as to lead them to shun the use of this weed. It is a filthy, unhealthy, expensive, and disgusting habit,—the handmaid to rum; the easy and convenient way of getting young men into saloons, and through the cigar introducing them to wine, beer, and whisky. The idea that a man with his mouth stained and saturated with tobacco shall

be permitted to place his filthy lips to the communion cup and go through with the solemn mockery of sipping in the name of Jesus its sacred contents, is near of kin to the cannibal's worship who goes from his feast of roast baby to make atonement before some heathen god.

The clerk in a "northern hotel," an intelligent, gentlemanly-appearing young man, recently said to me that his system was thoroughly poisoned with tobacco. "My throat," he said, "is all raw, and there are white, ulcerous-looking spots on it which I attribute to smoking. The doctors tell me I must stop smoking or die." He further said that he had worked in a tobacco factory at eight years of age, where he had learned to use it and kept it up. In France, I am told, its use has been strictly prohibited in all schools, military and other, in control of the government. Here let me call your attention to the difference between France and Michigan. In the "Reformatory," the prison at Ionia, they manufacture tobacco. Young men are actually put in a tobacco shop to work, and there they become thoroughly poisoned with the weed while being reformed (?) by the State. Precisely in every sense as well might the State attach a distillery to the prison and teach the convicts to make whisky. Both because of its moral and sanitary effect on men the powerful influence of the church should be brought to bear actively and directly on this question. Very likely those of the clergy who make earnest effort to save the boys from its use and shame the older ones into letting it alone, will meet with much opposition. But so has right always had to struggle. Sanitary reform will have to stand its share of abuse now as much as when in the early history of England complaint was made by the English of the Danes who came among them because the Danes were in the habit of combing their hair once a day, bathing every week, and frequently changing their clothes.

The study of the cause of disease and the best methods of preventing it ought certainly to be a part of any religion. The tendency of all truth is moral. The church cannot suffer if more effort is made from the pulpit to instruct the people how to live in order to be happy in this life as well as the next. In fact the church is now suffering very much because of its refusal to discuss advance questions. It used to be thought that theology comprehended every other science, and all instruction was given by the clergy; but as civilization grew and thought became more general and deeper, conflicts arose between those who looked further than the clergy and theology had taught, so there gradually came about a separation between science and the church, which used all its civil and ecclesiastical power to stifle investigation. Scientists were looked upon as infamous heretics. It was the policy of the church to cut off every philosopher. All manuscript that could be seized was burned. Men destroyed their libraries for fear some unfortunate sentence contained in the books should involve them and their families in destruction. It was thought right to compel men to believe what the majority had accepted as truth. The mystery of things above reason was held to be the very cause that they should be accepted by faith. "A singular merit was accorded to that mental condition in which belief precedes understanding." But the world has largely outgrown such nonsense. People are beginning to see that there can be no conflict of truth with truth. Real religion cannot conflict with science, for science is simply truth, and faith can have no abiding foundation until science has destroyed what it can.

There may be much claimed by scientists which they believe to be true but which is not. So it has been for ages with the church. The most monstrous

nonsense has at times been maintained as having divine revelation to sustain it. Now the pendulum is swinging the other way. Liberty to think has set many unbalanced minds into all sorts of utopian nonsense, so that we are quite as much in danger of a fanaticism of hostility to religion as we used to be of a fanaticism of religion.

"Science is after all but a higher development of common knowledge. Nowhere is it possible to draw a line and say here science begins."

To have its full influence in making people better the church must not, by force of creeds and theological dogmas, exclude from fellowship men who are not willing to work inside of a theological prison. The gospel of good health should be given equal prominence with the gospel of salvation. Questions of temperance, warming and ventilation, the marriage relation, the effect upon health of bad temper, the adulteration of food, as well as many other questions relating to our daily lives, ought to be fully and frequently discussed in church. Sanitary laws are moral laws,—God's laws. On what possible theory exclude them from the pulpit? The only answer is that the church has to deal not with things temporal but spiritual; that our schools and colleges must teach these questions. But there is no way to have people prosper spiritually and not physically. Again, school days are for the masses very limited. The knowledge gained there is soon to a great extent forgotten, unless life is such as to often require us to use it. At best it only disciplines the intellect, —teaches us how to think. Of the problems of life we need constantly to be reminded. Few have time for reading and many who do have time have no inclination.

How then are people to be reached better than through the pulpit, on these questions so closely relating to home life? I can see no better way than for the church to join hands with men of science. Cease all warfare on honest thought, and all the land over, from the pulpit give such sanitary instruction as will enlighten and save the people from the effects of continually living in violation of law. Of course this suggestion means work for the clergy. The dogmatic straw stacks that have been run through the machine so many times and from which all the grain was threshed ages ago, may be left to rest while the ministers go out into the fields of sanitary thought and raise a new crop of ideas. The church is now more a social than religious or intellectual organization. It ought not to be so. Nowhere in all the world should we have fresher truth, deeper, broader thought than from the pulpit.

The course I suggest would result in a complete revolution of the Sunday school. There is no good reason why this school should not be made a place where boys would be entertained and prefer it to playing truant, and with their rod go fishing. It is useless in these days to expect to bring up children with healthy spiritual minds unless they can have something better for mental food than "shucks."

A few Sabbaths since I heard a teacher explaining to her Sabbath-school class the kind of whale it was that swallowed Jonah. Another was telling how it was the sun stood still for Joshua, and still a third sought to make plain that the world was made in six literal days. I mention these things with no idea of unfriendly feeling to such schools, but to suggest that the classes should be taught by only the most carefully trained minds, and that the subjects for instruction should be largely material,—relating to the child's life *now*. I have faith to believe that if we do our best to have children live right in this world the Lord will supplement our efforts by keeping them right in the next. Saying this I do not forget that to have them right here we must

teach them in accordance with our best knowledge of law. The Sunday-school should have everything attached to it that the most careful teacher can suggest. The effects on the system of rum should be illustrated; so with tobacco. Explain to the older scholars the elements of natural science. The Bible itself may be taught in connection with all these subjects, and its variations, figures of speech, or mutilated translations explained. All angry disputes between thoughtful men concerning the relation of science to religion should cease, in fact such is now largely the case. What would have cost a heretic his life two hundred years ago may be,—nay now is,—freely stated from the pulpit. Prof. Winchell, from Ann Arbor, only a short time ago delivered an excellent discourse in the M. E. church in Ionia. His views are such that at the time of Galileo he would have been at once silenced by the church, and twenty-five years ago I think he could not have advocated them and been retained as a member in any orthodox denomination. I mention this to show that religion grows. Man's views of God's laws broaden with intellectual progress. Of course truth is eternal. It neither grows nor becomes less. Man's comprehension of it, however, grows. Getting knowledge enables us to see and understand things.

Society, now, is run at high pressure. In cities or villages there is very little home or domestic life; evenings are spent mostly at the club, theater, lecture, social, or saloon. To get money for all the demands is a sore puzzle to a man of moderate means. Everyone is nervous. Children are born so, and their lives, as led, but develop the disease. They soon learn to look at home as a place only to sleep and eat. To raise a boy and keep him steady, free from rum, tobacco, and of fair moral habits, is one of the intricate problems of the age.

The result of all this strife, in its effect on health, shows us many men broken down physically at an early age; others become insane. A medical expert, I think on the Guiteau trial, testified that only about one man in five is of sound mind, the others to some extent insane.

Now, ought not the Church take a leading part in such sanitary reform as will tend to correct the evils of which I speak? Our public schools can not be entirely trusted. What a vast amount of sanitary good would come if the pulpit would frequently and earnestly call attention to the evil that results from the overwork put on children in the school-room. I mean no thought of disloyalty to the schools, nor of unfriendly criticism of the teachers. Overwork and poor ventilation is not altogether their fault; it is the result largely of neglect of school interests by the Church, parents, and school-boards. But with the demands of the school, the social, church entertainments, and all sorts of evening parties, the strain put on child life from ten to twenty is very great; only the stoutest get through safe, the others becoming mental or physical wrecks, which we may see on every hand in our course through life.

Last Sunday evening a sermon on reading was delivered in the M. E. Church in Ionia. What we should read, and how to read it, was pointed out. The poisonous effect of the dime novel and Police Gazette literature on young people was made plain. Why not continue such talks, embracing all questions relating to poison of the mind and body? Show the people the poisonous effect of much of the wall-paper in common use. Explain how injurious to health is glucose as usually made and sold for sugar and candy. Analyze yeast powders and all villainous adulterations sold for food consumption. The evening discussion may well be of these matters that ruin the body, to the end that we may have better health and clearer intellects for the morning sermon on matters spiritual.

I think the course I suggest would enable the Church to do more good. Perhaps I am all wrong. What I have said, however, has been in no spirit of hostility to religion. The world needs all the moral and spiritual culture it can get. I believe, as Draper writes, that "There is a fairer hope for nations animated by a sincere religious sentiment, who, whatever their political history may have been, have always agreed in this, that they were devout, than for a people who dedicate themselves to a selfish pursuit of material advantages, who have lost all belief in a future, and are living without any God."

LEMUEL CLUTE.

The last paper was on the enforcement of sanitary regulations, by Hon. H. H. Holt, Mayor of the city of Muskegon, and is as follows:

THE ENFORCEMENT OF SANITARY REGULATIONS.

BY HON. H. H. HOLT, OF MUSKEGON.

It is the boast of our people that we are citizens of a free country, and that we can truthfully point to our government as being the freest, most independent, and, in fact, the best specimen of government the world ever saw. We are all proud to be able to say this; and it is certainly to be hoped that the time will never come when the fact will be otherwise.

While it is true that we are a free people, and that we have a government of which we are justly proud, is it not also true that there are serious defects in our governmental system? And further, is it not true, that these defects are rather increasing than diminishing? Is there not danger that the freedom of which we are so proud to speak is being carried to such an extreme that it is in some measure becoming an injury to us as American citizens? Experience has not shown that any danger is to be feared from the enactment of unjust and oppressive laws and ordinances; for while errors and hardships are occasionally noticeable—and these must, of course, be expected as long as imperfect human nature exists—legislators and others who have the authority in these matters are naturally too careful in regard to their own reputation and standing with the people at large to make any serious intentional approaches in the direction of oppression. There is no necessity of being on the guard in order to protect our rights as citizens, or to care for our freedom as individuals; but is there not danger, on the other hand, that this freedom in some measure may become a weakness rather than a strength, a curse rather than a blessing, a source of vexation instead of an occasion of our wonted boasting.

In fact, is there not sometimes occasion to lay aside some of our pride of country, and in fairness and impartiality ask ourselves the question: Is our government really strong enough, or, in other words, have we the ability to enforce the laws which the people, through our chosen representatives, have decided are necessary and proper?

This is a serious question, and one which should be freely and fully discussed. It is one, too, which must necessarily affect all classes alike, the humble and the exalted, the poor and the rich, and the old and the young. It is also one that affects the very vitality of our national existence under our present form of government, as it must readily be seen that if it shall at some distant day become evident that we have not this strength, that we have not the power in ourselves as a free people to enforce our own laws, is it not more

than probable that a revulsion will occur, and that a government based upon opposite principles, a government of force rather than freedom, be the result?

In discussing this question, let us first ask ourselves the question, What is a law of the State or locality, and where is the law to be found? Is the law to be found in the volume of laws and ordinances, and is it the text of those volumes, or is it merely the unwritten expression of public opinion, and in that great volume alone to be found—a volume, by the way, that is not engraven upon stone, and endurable as the ages; nor yet upon parchment, or even paper which cannot readily be changed; but instead of this, it is only to be traced upon the impulses and fancies of men which to-day may be one thing and to-morrow another, and in this locality having one interpretation, and in that locality another; here inspired by honest, conscientious motives, there by those which are mercenary and corrupt.

It must be admitted by all that the proper place to make inquiry for the laws of a State or locality is in the volume of the statutes and ordinances of that State or locality, and that whatever there is that is just and true in the way of law ought to be found in those volumes if it is not there already. It must be further admitted that whatever there is in those volumes ought to be regarded as the law and enforced accordingly.

Admitting that these statements are true in theory, it cannot be contended that they are true in practice so far as relates to the great mass of the people.

We all know that very many laws and ordinances, which are wholesome and necessary, are of no vital force, not alone because the people are opposed to their enforcement, but in many cases simply because public opinion does not appreciate the necessity for such enforcement.

More than this it cannot be claimed that it is the opposition in many cases of even a respectable minority of the people which is the occasion of the failure in the enforcement of many of our most salutary laws and ordinances; in fact it would seem that the greatest failures occur in cases where there is the least opposition, it appearing as if a certain amount of opposition were beneficial in arousing the people to activity.

As an illustration we have but to call attention to the act passed some ten years since to compel the attendance of children at school. This was a law that met with no opposition in any part of the State, and was a provision to which all classes gave assent, and was one that all admitted was salutary and wholesome, and that had it been enforced, would not only have been of great benefit to those for whose good it was intended, but would have been of lasting advantage to the State and community at large. Yet we all know that it was a dead letter from and after the hour when it nominally went into effect, and worse than all, no one ever heard of an instance anywhere in the State of an attempt being made by anyone, towards its enforcement during the ten years that it remained upon the statute books. And however well educated and thoroughly informed upon ordinary matters were teachers and others whose particular duty it was to see that this law was enforced, it is a most mortifying fact that they apparently were entirely ignorant of the existence of such a law.

The same rule applies to the enforcement of laws relating to the observance of Sunday, of laws relating to the use of profane language, and many other provisions of the statute to which we might call attention, to say nothing of numerous city ordinances.

More than this, it is a fact that so little attention has been paid to the enforcement of these laws that very many persons do not know of the existence of provisions of law to which they have been subject, perhaps for more than a

score of years, and those too that they have violated perhaps nearly every day during the time.

This is certainly a state of facts that is truly to be deplored by every law-abiding as well as liberty-loving citizen.

If the statements made thus far are correct, and if it is a fact that as citizens and communities in our love of freedom, we have allowed ourselves too wide a latitude in determining as to the laws which should be enforced, and have thereby inadvertently lost our respect for law, or perhaps more properly, have ceased to fully appreciate the obligations which the law imposes upon us, what is to be the remedy or remedies that are to be applied generally and in particular cases?

The first one naturally suggested is that the public mind be educated up to the necessity of the enforcement of the particular law as well as to the beneficial results that will be derived from such enforcement. And while this is a step in the right direction, it is only a partial remedy, for the reason that it is not bringing the public mind up to the necessity of a general observance of law, and besides is a remedy that is often not readily available. Those present who have had any experience in the enforcement of ordinances intended to prevent the spread of diphtheria and other contagious diseases will agree with me in this assertion. They have learned that it is next to impossible, particularly in communities where a large foreign element exists in the population, to make the people understand and appreciate the necessity for such ordinances. The result is, that it is next to an impossibility to bring about anything like an enforcement of ordinances which, to say the least, are not objectionable. Here too, we see an instance in proof of the assertion that public opinion is really the law, and that the written text of the statute book is not.

Perhaps the most effectual means of procuring the proper enforcement of laws and ordinances is to make an earnest effort to secure the election of suitable officers. Much may be accomplished by united action in this way, but it often happens that this cannot be done, and it still more frequently happens that the best of officers accomplish but little in the enforcement of particular laws simply because they are not sustained by public opinion in their efforts in so doing. Experience has taught us that very many officers who started out vigorously have gradually weakened in their ardor on learning that public opinion was either indifferent or decidedly against such enforcement.

We know that officers are but men at best; that many of their duties respecting the enforcement of law are unpleasant to them, to say the least; and we know too that officers are many times inclined to shun these duties and responsibilities, particularly at times when public opinion seems to be divided. It is for this reason more than any other that so many laws and ordinances are poorly or partially enforced.

How necessary is it then that all good citizens should assist the officers, if nothing more, by their presence at proper times, thus helping to determine the direction of public opinion instead of purposely or negligently remaining away fearful less some odium may attach to the fact of their presence. Besides this, if my theory is correct, that public opinion is really the law, there is still a greater necessity that citizens generally should act in accordance with the latter suggestion. This also is sufficient to show that everyone, no matter how humble his position in the community, has a duty in this respect, one that as a good citizen he cannot avoid, and one that he cannot throw entirely upon the shoulders of those who are at the most only his represent-

atives. His duty as a citizen is not complete on the day of election. It is also a part of his duty to assist his chosen representatives at all proper times and places in helping to carry into effect the laws and ordinances which other agents have decided are proper and necessary for the public good.

A correct public opinion requires the enforcement of every law and ordinance of the locality while it remains on the statute book, and in this respect every citizen has a position as well as a responsibility. It is his duty to assist in bringing public opinion to this standard; and whoever is not doing so is not doing his whole duty, nor is he who advises a discrimination as to the laws which in his opinion should be enforced. The man who advises against or opposes the enforcement of a particular law, simply because the law does not meet his approval, is injuring the State at large in just the degree that his influence extends. A man of this class is not only assisting to destroy the power which would compel the enforcement of such laws as he may not perhaps approve, but he is destroying the power which would compel the enforcement of every law of the present and future.

All men are of course equal before the law, and when a man advises against or is even indifferent as to the enforcement of a law or ordinance he must at the same time concede to every other man the same right of opinion as to the enforcement of every other law and ordinance on the statute book, and the result cannot be avoided. It would seem as if the great mass of the people were acting upon this principle or rather want of principle.

It would seem that the true course for one to pursue who is desirous that a law or ordinance bearing upon a particular subject should be enforced as well as enacted in the future, would be to assist in preparing the way for this by directing his efforts toward the bringing of public opinion up to the necessity of the enforcement of whatever there is, if anything, at present on the statute book relating to the particular question. If this could be accomplished and public opinion firmly planted upon that elevated plane where the statute book may be successfully searched to ascertain what in fact is the law of the locality, the banner of victory at the success of a cherished principle might then be planted on the day of the enactment of a statute containing that principle, instead of our being obliged to wait and fight the main battle, and perhaps with doubtful success, long afterwards. If it be true, as it would seem, that the education of the people as to the necessity of sanitary regulations is a remedy too slow in many cases to have the desired effect, and if the education of public opinion as to the propriety of a general enforcement of law is still slower, the only remaining remedy must be sought in the law itself, and the question then is what can be done to make these sanitary laws and regulations more effective? What amendments and changes shall be made to accomplish this purpose?

Experience has shown that the laws and regulations of the United States are more rigidly enforced than those of the States, but it would not seem advisable for the general government to attempt the enforcement of sanitary regulations unless it be in the seaport towns in connection with the arrival of immigrants. As regards this matter as between the State and local governments, there is but little choice as to efficiency, and it would seem that the best and perhaps the only thing to be done by the State, would be to try to bring about a uniformity so far as possible in these sanitary regulations throughout the various localities of the State. At least it would be advisable that the Legislature of the State should determine as to what diseases are to be treated as contagious, and perhaps also determine as to the period within

which danger may be feared from contagion, as such enactments would not only be beneficial in themselves, but would also have a tendency to call the attention of the people to the necessity as well as the existence of the law.

REPORTS OF COMMITTEES.

REPORT OF THE COMMITTEE ON SANITARY APPLIANCES.

To the President and Members of the Sanitary Convention held at Greenville, Mich., April 11 and 12, 1882:

Your committee on Sanitary Appliances begs leave to report as follows:

The Sanitary appliances submitted for the consideration of your committee consist of vitrified sewer-pipes, junction-pipes of various kinds, and hard vitrified brick for lining wells, of the Jackson Fire Clay Co.

The pipes and junctions are of the kind generally used for house drains and small sewers (those not over 18 in. diam.), and appear to be of excellent quality, so far as can be judged by such an examination as we were able to make (no facilities for a crucial test having been presented to your committee). The company appears to be careful not to send out for sewer purposes pipes defective in contour or perfection of the walls, selling such as "defective pipes" for clear water-courses, and for land drainage. For the latter, however, we think continuous unglazed porous pipes to be better.

The collection is accompanied by some pamphlets, good in many respects, but containing some defects in regard to drain-ventilation, "Sewerage Illustration," and the drainage of cellars. Your committee does not suppose any useful purpose will be served by discussing these at length in this report.

All which is respectfully submitted.

WM. OLDRIGHT,
O. G. FOX,
E. P. CHURCH.

REPORT OF COMMITTEE ON RESOLUTIONS.

Resolved, That in reviewing the proceedings of this convention, we must recognize in its marked pleasure and profit, the happy selection of the chairman, the Rev. J. L. Patton, the unwearied efforts of the secretary, C. S. Sheldon, M. D., the interest of the city press, the attendance of reporters for papers here and abroad, and the large and constant attendance of the citizens of Greenville and the vicinity, and their hospitality; and that the trustees of the Congregational Society have our thanks for the use of their comfortable house of worship.

Resolved, That we are especially gratified in the presence of the Governor of our State, and that members of the State Board of Health of Ontario have placed us under great obligations by their participation in the proceedings, and we heartily extend to the Board they represent our good wishes.

Resolved, That the papers and addresses, embodying careful research and mature thought on the several topics, are valuable contributions to sanitary science, which should have wider dissemination in print.

Resolved, That while placing on record an emphatic expression of the value of such conventions, we would respectfully suggest that in future in the program more time should be given to comparison of views by those present.

Resolved, That we are gratified to learn of the efforts of the Board of Health in disseminating information among the people, and we second their recommendation of associations where interest may be enlisted.

GEO. D. GILLESPIE,
H. H. HOLT,
JAMES SATTERLEE.

These resolutions were responded to by several gentlemen in attendance, and Hon. H. H. Holt spoke favorably of the uniformly large attendance at the sessions of the Convention, and of the general arrangements for the meeting.

Gov. D. H. Jerome made remarks of a genial and entertaining character, in which he spoke in high praise of the people of Greenville, the work of the convention, and especially of the work now being done by the State Board of Health. He thought highly of the plan of holding such conventions in various localities to educate the people and forward sanitary reform.

After the reading of the report of the Committee on Resolutions, Bishop Gillespie remarked on the efforts now making to improve the sanitary condition of our homes and places of residence. He said that the second sanitary convention was held at Grand Rapids two years ago, and at that time they formed a local sanitary association, and although the attendance at the meetings was not always large, they were always well reported, and had done some good work in looking after things. He thought such associations should be formed in different localities to co-operate with the State Board of Health. If practicable, he would like to see such an association organized in Greenville.

Dr. Jno. Avery, in behalf of the State Board of Health, wished to express the thanks of that body to the officers of the convention and to the people of Greenville, for their efforts in making the meeting so successful as it had proved. It had been a great benefit to have brought the people and the Board together, that they might get better acquainted. He also wished to thank the visitors from abroad who had added so much by their presence, and all who had so generously given of their time and labor in the preparation and reading of papers.

The reports of committees and the resolutions were adopted by the convention.

The president of the convention, Rev. J. L. Patton, said that he was proud of Michigan and her State Board of Health. He did not know before what they were doing. He expressed his thanks to our Canadian visitors for their presence, and to the Board of Health for bringing such a convention to Greenville. He also thanked Bishop Gillespie for his suggestion as to the formation of a sanitary association here.

Hon. C. C. Ellsworth said that the people felt under great obligations to the Board of Health. The only criticism he could make on the work of the convention was that there had been almost *too* much, though everything was good. The people had enjoyed the meetings wonderfully, and had been much benefited. He moved a vote of thanks to the State Board of Health, the visitors from abroad, and the officers of the convention. This motion was put and carried unanimously.

Dr. Oldright returned thanks for the very kind reception which had been given him, and he should gladly embrace the opportunity to repeat this visit if opportunity should offer.

Hon. C. C. Ellsworth said he was anxious to make a move for the organization of a sanitary association in Greenville at once, and moved that a committee of three be appointed to make the necessary arrangements. This motion was carried. The president appointed as such committee Hon. C. C. Ellsworth, Dr. C. S. Sheldon, and Dr. Jno. Avery.

A closing benediction was pronounced by Bishop Gillespie, and the convention adjourned *sine die.*

CHARLES S. SHELDON, A. M., M.D.,
Secretary.

RELATIVE TO TEARING DOWN PLACARDS OF DISEASES DANGEROUS TO THE PUBLIC HEALTH.

AN OPINION BY HON. LEROY PARKER, PRESIDENT OF THE STATE BOARD OF HEALTH, AND COMMITTEE OF THE BOARD ON LEGISLATION IN THE INTERESTS OF PUBLIC HEALTH.

HENRY B. BAKER, M. D., *Secretary State Board of Health:*

DEAR SIR:—Your favor of Oct. 25, containing card of T. C. Duel, asking "if there is any law to prevent people tearing down from their gates diphtheria placards placed there by the board of health," etc., is received.

In reply I would state that under section 1730, Compiled Laws 1871, when small-pox or any disease dangerous to public health shall break out in any township the board of health shall provide a hospital or place of reception for the sick or infected, etc., and such place of reception shall be subject to the regulation of the board of health. Sec. 1731 provides that the house or place where the sick shall remain shall be considered as a hospital, and all persons in any way concerned with the same shall be subject to the regulations of the board of health.

Sec. 1732 authorizes the board of health to use all possible care to prevent the spread of diseases, and to give public notice of infected places, by such means as shall be most effectual for the common safety. Sec. 1733 provides that if any person in any hospital or place of reception before mentioned (and this would include a private house quarantined), or who shall approach the same, shall violate *any* of the regulations lawfully made in relation thereto, the person so offending shall forfeit a sum not less than ten nor more than one hundred dollars.

From these sections it will appear that the posting of a notice of a disease dangerous to public health is a lawful regulation of a board of health, and any interference with such regulations by hindering its public announcement, such as would result from tearing it down, would be a violation of such regulation, and subject the offender to the penalty imposed by section 1733.

This is perhaps a roundabout way of getting at this offense, but I regard it as effectual. It would be well if we had a special clause bearing directly upon this point. But for present purposes I regard the power conferred in the sections quoted as ample to secure the punishment of persons offending against the regulations of the board of health by tearing down notices, etc.

Respectfully, LEROY PARKER.

Flint, Mich., Oct. 27, 1881.

MEETINGS AND EXPENSES OF TOWNSHIP BOARDS OF HEALTH, AND SALARIES OF HEALTH OFFICERS.

OPINION BY HON. LE ROY PARKER, PRESIDENT OF THE STATE BOARD OF HEALTH, ON QUESTIONS SUBMITTED BY H. M. SPICER, SUPERVISOR OF THE TOWNSHIP OF CRYSTAL LAKE, BENZIE CO., MICH.

QUESTION 1.—When the township board is called together to act as a township board can it act as a board of health, or has it to be called together as a board of health in order to act on matters pertaining to the health of the township? Is a notice to meet as a township board sufficient to give it (the township board) power to act at the same time on matters pertaining to the sanitary condition of the township? Finally, is there any difference between the township board and the board of health in their jurisdiction?

OPINION.—There can be no doubt but that the township board when called together or sitting as a township board can act as a board of health by a simple request or direction of the supervisor, as president of the board of health, or of any two members of the board. This can be done without any previous notice. Section 2 of chapter 46, C. L. 1871, as amended by act No. 56 of the Session Laws of 1877, provides for calling special meetings of the board of health by the president or any two members, and when the township board is called and is sitting in that capacity it can instantly resolve itself into a board of health by order of the president or of any two members. A notice to meet as a township board would not of itself give the board power to act as a board of health, but when assembled in pursuance of such notice it can proceed as above suggested, without any special notice that it is called to act as a board of health. The township board and the board of health of the township have no jurisdiction in common. Their powers and duties in each capacity are as distinct as if they were each composed of a different set of individuals. But the fact of their being composed of the same persons enables them to act in either capacity at will.

QUESTION 2.—Can the necessary expenses created by the board of health in carrying out or enforcing the laws pertaining to the health of the township be paid out of the contingent fund of the township, or must the electors at the annual meeting vote a health fund? Can the board of health issue orders on the contingent fund, or must they (the board of health) report to the township board and they issue the orders?

OPINION.—The necessary expenses of the board of health in carrying out or enforcing the laws pertaining to the health of the township must be paid out

of the contingent fund of the township, except in certain cases specified by the statute, when they are payable by the county. These excepted cases are provided for in sections 1706 and 1714, C. L. 1871. Section 1736, C. L. 1871, provides that every township may, at any meeting, vote to raise a sum of money to pay for the inoculation of the inhabitants with cow-pox. In other cases when expense is incurred by the township board of health in pursuance of law, such expense must be paid out of the contingent fund, and no vote of the people is requisite. By section 1693, C. L. 1871, as amended by the laws of 1877 (Act No. 56), the board of health is impowered to regulate and audit all fees and charges of persons employed by them in the execution of the health laws and of their own regulations, including the salary of the health officer. Such of the charges as are payable by the township must be paid by the township treasurer upon orders signed by the supervisor and clerk. The board of health having audited the claims and allowed them, there is nothing for the township board to do. The law gives the board of health the right to audit its own expense accounts, and the supervisor and clerk being members of the board of health can easily sign the orders on the treasurer.

Respectfully,

Flint, Mich. LeRoy Parker.

VERIFICATION BY THE HEALTH OFFICER OF DIAGNOSES OF DISEASES DANGEROUS TO THE PUBLIC HEALTH.

OPINION BY HON. LE ROY PARKER, PRESIDENT OF THE STATE BOARD OF HEALTH, AND COMMITTEE ON LEGISLATION IN THE INTERESTS OF PUBLIC HEALTH, ON QUESTIONS SUBMITTED BY WM. H. SMITH, M. D., HEALTH OFFICER OF ST. CLAIR CITY.

The following, from a letter received from Wm. H. Smith, M. D., Health Officer of the city of St. Clair, was referred by the Secretary to Hon. Le Roy Parker, President of the Board, and Committee of the Board on legislation in the interests of public health:—

Sections 1734 and 1735, Compiled Laws, provide for reports of diseases dangerous to health, and a penalty upon the householder and physician for not reporting. This question, however, may arise: A physician is called, diagnoses diphtheria or some other contagious disease when it does not exist, and makes no report. What should be done with such a man? The family are falsely informed that it is diphtheria; he so tells the neighbors, but says nothing to the health authorities. The board are accused of partiality, inasmuch as they do not quarantine this case of reported diphtheria as they have others; and yet what can they do? If the attending physician is prosecuted, he may set up the claim, which is true, that he was not treating a contagious disease. How is such a matter to be legally reached? If a practitioner of medicine be allowed to do this thing with impunity, how is it to be distinguished from a failure to report a *bona fide* disease? In a word, upon what kind of reasons for believing that there is a violation of the law should a health officer act in notifying the prosecuting attorney?

It is possible that he might go and see the sick person; but certainly that would not do unless the health officer was a physician. In that case he could distinguish the disease, but would be open to the suspicion of using his office as an excuse for tampering with other men's patients.

For some reasons it would seem as if the name which the attending physician gives the disease, and under which he professes to treat it, should stand. It at least ought to so far as the householder is concerned. Whether it would or not for the physician does not seem clear. Has this question ever been settled? and if so, in what manner?

Very respectfully,

St. Clair, Mich., Oct. 10, 1881. W. H. Smith.

REPLY BY MR. PARKER.

To these questions Mr. Parker made the following reply:—

In regard to the inquiries by Dr. W. H. Smith, health officer of St. Clair, contained in his letter of October 10, 1881, addressed to you as Secretary of the Board, which letter was referred to me, I have this to say: When a physician diagnoses a case as diphtheria or some other disease dangerous to the public health, it is his duty under sections 1734 and 1735, Compiled Laws of 1871, to report the same to the health officer. If he does not so report after determining that the disease is one dangerous to the public health, he should be prosecuted as the law directs. The fact that the disease may prove to be something else should make no difference in the action of the health officer. I regard it as impracticable for health officers to investigate reported cases of diseases dangerous to the public health, with a view to ascertain if there may not be a mistake in the diagnosis of the attending physician.

The responsibility of judging of the character of a disease, when the disease is pronounced a contagious one, should be left to the attending physician, if one be employed, otherwise complications would frequently arise which would be detrimental to the public health service. For instance: A physician is called to attend a case which he pronounces to be diphtheria. He reports the case to the health officer, who then proceeds to take such steps as are necessary to prevent the spread of the disease. If a mistake has been made in the diagnosis of the case, and it proves to be something non-infectious, no harm has been done by the precautions of the health officer. He is justified in the measure he has taken, by the report of the attending physician.

If, on the other hand, the health officer should undertake to examine the case, and should decide that it was not an infectious disease, and should refuse to take any precautionary measures, there would at once arise a contest between the health officer and the attending physician and his friends, which could not fail to shake the confidence of the public in the public health service. If the diagnosis of the health officer should prove to be incorrect—and there is no guaranty that a health officer will be able to diagnose a case any more truly than the attending physician—and the disease should prove to be contagious, then the very result sought to be guarded against, *i. e.*, the spread of the disease, would be brought about by the action of the health officer.

It will always be best, except under very peculiar circumstances, for the health officer to accept the statement of the attending physician, that a disease is of a contagious character, and proceed accordingly. There should never, if possible, be any ground for disagreement between a health officer and the physician attending the sick, such as would naturally arise were a health officer to refuse to accept the diagnosis of an attending physician who has decided that a contagious disease exists.

Another question not so easily got along with, is where an attending physician gives the name of some non-infectious disease to that which is really infectious, and fails to report it on account of his mistaken diagnosis. In such case great danger to the public may ensue by reason of its not being warned, and no measures being taken to prevent the spread of the disease. If a health officer is made aware of such a case, and has good reason to believe that the disease may be one dangerous to the public health, he should certainly take all necessary steps to warn the public, and to restrict the spread of the disease. In what way the health officer shall satisfy himself that the disease is of an infectious character, it is

difficult to determine beforehand. Of course an intelligent physician would rarely mistake the character of a disease. An ignoramus would be very likely to, and would be very tenacious of his opinion. It would be impossible for every health officer to investigate every case of sickness occurring in a community in order that he might ascertain whether it was of a contagious character, as this would entail an amount of labor upon the health officer, which would be burdensome, and would be unpleasant to himself and the family afflicted. He ought under no circumstances to intrude himself into a sick-room with the idea of finding out whether the disease from which the patient is suffering may not be one which demands his attention, unless he has some reason to believe that the disease is a dangerous one.

If it is once thoroughly understood by physicians and householders that a failure to report a case dangerous to the public health will certainly be punished as the law directs, much greater care will be exercised by physicians in diagnosing cases which they are called upon to treat. But there will occur cases when physicians and householders will make honest mistakes as to the character of the disease. In such cases no punishment can be inflicted for neglecting to report a disease dangerous to the public health, as the law makes the knowing the disease to be a dangerous one an essential ingredient of the offense. It will thus be seen that absolute knowledge of every case of disease dangerous to the public health cannot in all probability be obtained; and the most that health officers can hope to do is to guard against those cases which ordinary human knowledge determines to be contagious and dangerous. The employment only of skilled physicians will be one of the most effectual preventives of the evils which flow from defective diagnosis of disease. Yours respectfully,

Flint, Mich., Nov. 9, 1881. LEROY PARKER.

OVERFLOWED LANDS ON THE MAPLE RIVER.*

REPORT BY JOHN AVERY, M. D., OF GREENVILLE, MEMBER OF THE STATE BOARD OF HEALTH, AS A SPECIAL COMMITTEE TO INVESTIGATE COMPLAINTS OF CITIZENS OF GRATIOT AND CLINTON COUNTIES RELATIVE TO OVERFLOWED LANDS ALONG THE MAPLE RIVER.

In compliance with a request made by this Board at its session October, 1881, I visited the overflowed lands along Maple river, in Gratiot and Clinton counties, on the 25th and 26th days of October, 1881. At Bridgeville I met Mr. P. R. Phillips, and Dr. W. D. Scott, of Ithaca, Mr. Byron Hicks, supervisor of the township of Washington, and Dr. Turner of Bridgeville, a gentleman who, with the exception of a short interval, has practiced medicine in that vicinity since 1850. Mr. Phillips settled on Maple river, between Maple Rapids and Bridgeville, in 1850, and has lived there and at Ithaca ever since. Dr. Scott has lived all his life in Clinton county near Maple Rapids, and at Ithaca, Gratiot county. He has practiced medicine twelve years, the first six at Maple Rapids, and since at Ithaca. At St. Johns I met the Hon. S. S. Walker, and Drs. Louis Fasquelle and S. E. Gillam. Dr. Gillam until recently has practiced medicine at Elsie, near Maple river, and Dr. Fasquelle as one of the oldest practitioners of medicine in Clinton county, is familiar with the diseases that have prevailed along this river during the last twenty-five years. Hon. S. S. Walker, as member of the board of regents, in the summer of 1880, had a survey of this river from Maple Rapids to Bridgeville made by the class in civil engineering of the Michigan University. In this way and from his long acquaintance in Gratiot and Clinton counties, Mr. Walker has become an interested observer of the diseases incident to the locality of these overflowed lands. All of these gentlemen gave me valuable information, and some of them have reduced the result of their observations to writing, and it is herewith submitted.

The point at which I commenced my investigations is Bridgeville, Washington township, Gratiot county, a hamlet of some 150 inhabitants on Maple river, where the State road from St. Johns to Ithaca crosses it. The bridge at this point is 350 yards long and the approaches to it some 30 yards more, indicating the overflowed lands at this point to be something near a half-mile in width. And these lands at the time of my visit were covered with water

* [An article on the effect on public health of overflowed lands adjacent to Maple river, by S. E. Gillam, M. D., of St. Johns, is printed on pages 184-190 of this volume. Dr. Avery's report was made January 10, and Dr. Gillam's paper was read April 12, 1882.]

varying in depth from a few feet to a few inches. I did not go up the river from Bridgeville, but am informed that there is as large an area of land overflowed above Bridgeville as between it and Maple Rapids, and that the condition of these lands is not materially different except there is more dead timber standing above than below Bridgeville. From Bridgeville we went in a skiff to Maple Rapids, some fifteen miles by the river, and about seven in a direct line. Between these two points the overflowed lands vary in width from one-half to three-fourths of a mile. Originally these lands were covered with a heavy growth of timber consisting of white ash, black ash, white maple, and swamp oak. Mr. Phillips says, "the timber on these bottom lands was nearly all white ash mixed with some white maple and black ash, and as you neared the hard land there was some swamp oak." This timber was once most beautifully festooned with the wild grape vine, from which I have myself gathered fruit, before the dam at Maple Rapids was built. This timber is now all dead, killed by the water, and a large portion of it has been cut off for fire-wood by the settlers on either side of the river during the winter seasons, leaving the bark, tops, and other debris to decay in the water during the summer season. Except in the channel of the river these lands are now covered with wild rice, "cat-tail" flags, tall, rank grasses, and other water-plants, and are the resort of wild ducks and the home of the musk-rat. On our trip down the river we met several Indians and white men looking after their musk-rat traps, and sportsmen after ducks. We saw Indians pushing their canoes through the wild rice and flags from six to eight feet high and so thick that you could see their parting tops long before you could see the canoe and its occupant. This dense mass of vegetation dies down during the autumn and winter, decays during the summer, and becomes the fruitful source of disease to all those living within the radius of its influence.

The dam at Maple Rapids was built in 1852 and 1853, and it is estimated that from six thousand to eight thousand acres of land are flowed by it. During the spring and fall these lands are covered with water. The heat of summer evaporates this water and leaves only stagnant pools and decaying vegetation to cover this great acreage. These overflowed lands, to a large extent, form the back ends of farms lying on either side of the river, and ever since the erection of the dam have been a source of complaint from all those living within one or two miles of the river. At first the settlers in that new country looked upon the dam as an improvement of which they were proud, as it furnished a power for the manufacture of lumber, of which they were in need, and to some extent a market for such products as they had to spare. The greater portion of the logs cut at this mill were floated down the river from Gratiot county, but the pine from this source was exhausted some three or four years since. But before this, steam had been substituted for water as a power in the mill, and the dam was used only to create a reservoir for the storage of logs, of which only a few, of hard wood, came down the river. For the last two years the dam has been out of repair, and the citizens began to hope that it would not much longer remain an obstacle to the thorough drainage of these lands. But when they commenced to move in the matter of drainage, Mr. Heine repaired his dam and flooded the lands again. The uniform testimony of all the physicians who have practiced in that vicinity, and of all the inhabitants who live near these overflowed lands, is that they are the cause of much sickness, and that the dam at Maple Rapids creates a nuisance that ought to be abated.

Dr. Fasquelle says: "I have practiced medicine in St. Johns for nearly 27 years, and there has been more ague, intermittent, remittent, bilious, and typhoid fevers, and dysentery within two or three miles on each side of that river than in any other section of four times the same extent in Gratiot or Clinton counties." Maple river is a sluggish stream throughout its entire length, and wherever dams have been built across it it has been at the expense of a very large acreage of overflowed lands. Taking its source in Shiawassee county, it makes its way north into Clinton county, passes through the township of Ovid into Duplain, where it seems to have left its natural channel near Rochester colony and to have wandered up into Gratiot county for the purpose of gaining sufficient elevation from which to flow down into Grand river, or perhaps with a determination of going to the "Bad."

Extending from this river in the township of Duplain on the east, through the township of Greenbush and into the township of Essex, nearly to the river again on the west, is a large cedar swamp and marsh, some eight or ten miles in length and from one mile to a mile and one-half in width. This marsh and swamp is drained into Maple river both from its eastern and western extremities, and is believed by many to have been once the channel through which Maple river flowed in its course to Grand river. Thirty years ago this swamp formed an almost impassable barrier between the townships of Bingham and Greenbush. Now there are several good roads across it, a considerable portion is under cultivation, a larger portion is yielding large crops of excellent grass, and soon this entire marsh and swamp, the dread and horror of the early settlers, will be counted among the most valuable lands in Clinton county, a good illustration of what drainage can accomplish in reclaiming waste lands.

From Bridgeville to a point just below the dam at Maple Rapids, as determined by the survey made in 1880, there is a fall of some 8.66 feet, making it easily practicable to drain these overflowed lands if the dam at Maple Rapids was out of the way. This dam at the present time renders valueless some six or eight thousand acres of land that could otherwise be made productive; it imposes a large yearly tax upon the citizens of Gratiot county to maintain roads and bridges across these overflowed lands; it depreciates the value of adjoining lands, and to some extent property throughout the entire county; and what is of vastly more importance to this Board and the people of that locality, it causes a great amount of sickness among the inhabitants living along this river within one or two miles of these overflowed lands; and so far as I can discover it yields at the present time no compensating good to any one. In my judgment this dam creates a nuisance, and one that it is impossible to abate while it remains. Its removal, then, is the first step towards the drainage of these lands. The local board of health of any township suffering from this overflow has the right, and it is its clear duty, to declare this dam a nuisance, and to order its removal, and upon the failure of the owner to comply with the order to commence proceedings in the courts to compel its removal. The board of supervisors can add force to the authority of the local board of health by giving assurance that the county will stand behind any effort to abate the nuisance.

All of which is respectfully submitted, together with resolutions of the Board of Supervisors of Gratiot county, and letters from P. R. Phillips, S. S. Walker, and Parker Merrill.

JOHN AVERY.

RESOLUTIONS OF THE BOARD OF SUPERVISORS OF THE COUNTY OF GRATIOT, RELATIVE TO THE OVERFLOW OF LANDS ADJACENT TO MAPLE RIVER.

WHEREAS, It is well known that since the earliest settlement of Gratiot, Maple River, owing to the sluggishness of its current naturally, rendered more so by the dam constructed across said river at Maple Rapids, in Clinton county, has been and is at this time a serious detriment to the best interests of Gratiot county by reason of the greatly increased expense of maintaining bridges across said river in Gratiot county, and what is of incomparably more importance, the engendering of malarial diseases among the people living in the vicinity of said river, consequent on the drying up of a large amount of stagnant water and the overflowing of thousands of acres of naturally valuable land, rendering said lands nearly valueless; and—

WHEREAS, The State Legislature at its session in 1881 made an appropriation of swamp land to dredge out and deepen the channel of said river; and—

WHEREAS, Certain parties at Maple Rapids have rebuilt and are maintaining the dam across said river, thereby rendering such appropriation utterly valueless; now therefore,—

Resolved, By the Board of Supervisors of Gratiot county, that in the opinion of this Board, the dam accross Maple River at Maple Rapids is a serious detriment to the best interests of Gratiot county for the reasons stated above, and the State Board of Health are hereby requested to investigate the matter and to advise the removal of said dam as being detrimental to the health of the communities living in the vicinity of said river, and for being a nuisance generally.

The County Clerk is hereby directed to transmit a copy of this preamble and resolution to the State Board of Health.

Ithaca, Mich., Jan. 4, 1882.

I hereby certify that the above resolution was unanimously adopted by the Board of Supervisors of Gratiot county, Michigan, at their January session, 1882.

[L. S.] J. M. TRASK, *County Clerk.*

RESOLUTION ADOPTED BY THE STATE BOARD OF HEALTH, JANUARY 10, 1882.

WHEREAS, The Board of Supervisors of Gratiot county has passed resolutions asking this State Board of Health to investigate the subject of the sickness caused by the overflow of Maple River, because of the dam at Maple Rapids, and "to advise the removal of said dam as being detrimental to the health of the communities living in the vicinity of said river," therefore,—

Resolved, That the Board of Supervisors of Gratiot county be informed that this Board has already had an investigation made, and from the report of such investigation is convinced that the dam at Maple Rapids causes a nuisance, and does advise, that, in case the owner of said dam will not remove the same and thus abate the nuisance caused by the overflowing of lands along said river, a bill in equity should be filed against the owner of said dam to compel him to remove the same.

ABSTRACT FROM A LETTER FROM P. R. PHILLIPS, OF ITHACA, MICH.

I was a pioneer in Gratiot county, there being only four or five families in the county when I moved in. The mill-dam was built two years after I settled there. For the first ten years I had health and a fair share of prosperity; then our sickness began. First, ague, then fever, then typhoid fever, and dysentery, almost continually, until we lost two of our children. Our doctor said the children were impregnated with bilious diseases—that I would have to leave my home;

so in my old age I am deprived of the privilege of enjoying the home I carved out of the wilderness, for the sake of keeping up a dam that has not been used for four years, except to boom logs in the pond it causes. I have not lived on my place for eight years, and I cannot sell it on account of the noted bad health of the place.

Ithaca, July 30, 1881.

LETTER FROM PARKER MERRILL, ST. JOHNS, MICH.

I have been situated where I have heard a large amount of the talk and complaints about the nuisance on Maple river, in Clinton and Gratiot counties, caused by the dam at Maple Rapids, which makes an obstruction to the natural current of the water in the river, the damaging effect of which is seen for eight or more miles up the river above the dam, by overflowing several thousand acres of land just long enough each year to make it worthless, and to create a swamp that is an object of dread to all that see it and all that are obliged to live near it. I owned a farm within one mile of the river, on the north side of it, and disposed of it at a low figure on account of the damaging effect of the river being in its present condition. About ten years ago I was employed by the supervisors of Gratiot county as a civil engineer to take the levels of the river from the dam up as far as Bridgeville, and was satisfied that by removing the dam (and doing some dredging, as the dam has been there so long that the bed of the river has filled up some near the dam) the great nuisance might be removed. I think every citizen in the south half of the townships of Fulton and Washington feels that the damming of the river is a great damage to them, and in their behalf I pray that if you can do or say anything that may lead to the removal of *the* great nuisance in that section of country that you will do so at your earliest convenience, and I know that many will feel thankful.

St. Johns, Mich., Dec. 26, 1881. PARKER MERRILL.

LETTER FROM HON. S. S. WALKER, OF ST. JOHNS.

Dr. Avery called on me some weeks since relative to a map of Maple river, with reference to its improvement and drainage. The map was made in the summer of 1880 by the engineering class of the University, as part of their annual field work. The study of the river for some distance above and below the rapids was very thorough, and resulted in a demonstration that the river could be drained with a comparatively small amount of labor, and that from 5,000 to 6,000 acres of superb bottom meadow land would result, besides the great advantage in a sanitary point of view. I will add here that almost every member of the class of engineering that was engaged in the survey was attacked with chills while there or soon after.

The Board of Control of State Swamp Lands, in reply to a petition for the use of the appropriation of 10,000 acres made by the last Legislature for the purpose of draining this river, and after an examination of the survey above referred to, with the notes and account accompanying it, directed the late Mr. Haviland to make a personal inspection of the proposed improvement. I went with him to Maple Rapids, and he, with a gentleman who is entirely familiar with the whole ground, passed over it in a boat, Mr. Haviland returning to St. Johns with me. His whole conversation after the examination of the matter was most emphatic as to the desirability, necessity, and comparative ease of making the improvement, and he was quite severe in characterizing the community that would continue to tolerate such a nuisance as almost "barbarous." I furnished Mr. Haviland with the entire papers in the matter of the survey, and he was to report the results of the examination to the Board. From here he went on further trips for similar purposes, and immediately after the next meeting of the Board wrote me that he had been so busy he had not been able to complete the report. He was immediately taken with the sickness that soon after resulted fatally. Were it possible to locate the exact spot where he was inoculated with the fatal miasma, it would not be surprising if it were found to be at the Maple river.

I shall be glad to be of any assistance I may in the matter of the improvement of Maple river; not that I have a single dollar at stake, but because I regard it as a terrible nuisance, and a stigma on civilized society to allow it to remain as it now is. Very truly,

St. Johns, Dec. 26, 1881. SAMUEL S. WALKER.

THE WORK OF HEALTH OFFICERS,

AND OF LOCAL BOARDS OF HEALTH IN MICHIGAN.

[A sufficient number of copies of this circular, stating duties of the health officer, are sent to enable him to give one copy to each member of the local board of health; and this he is respectfully requested to do, in order that the local board, which controls his action and fixes his compensation, may have the benefit of its suggestions as to the importance, nature, value, and extent, of his duties, and of its own powers and duties.]

[55.]

OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH,
LANSING, MICHIGAN, April, 1882.

To the Health Officer:

SIR:—Inquiries are frequently received at this office for statements of the duties of the health officer as a sanitary adviser and executive officer of the local board of health. In response to these inquiries this circular is issued.

There is a board of health in every township, city, and village in Michigan;* and the appointment of a health officer is required of every local board of health in the State by section 1693 of the compiled laws of 1871, as amended by Act No. 202, Laws of 1881, which amended section is as follows:

(1693.) Sec. 2. Every board of health shall appoint and constantly have a health officer, who shall be a well-educated physician, and act as the sanitary adviser and an executive officer of the board: *Provided*, That in townships where it is not practicable to secure the services of a well-educated and suitable physician, the board may appoint the supervisor or some other person as such health officer. The board of health shall establish his salary or other compensation, and shall regulate and audit all fees and charges of persons employed by them in the execution of the health laws, and of their own regulations. Within thirty days after the annual township meeting in each year, the board of health shall meet for the transaction of business, and shall appoint or re-appoint a health officer, and shall immediately cause to be transmitted to the Secretary of the State Board of Health at Lansing, the full name and postoffice address of such health officer, and a statement whether he is a physician, the supervisor, or some other person not a physician. A special meeting of the board may be called by the order of the president or of any two members of said board.

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* Township boards of health are organized under section 1692, compiled laws of 1871, as amended by Act No. 56, Laws of 1877, which section as amended is as follows:

(1692.) SECTION 1. In every township the township board shall be the board of health. The supervisor shall be the president, and the township clerk shall be the clerk of said board. The clerk shall keep a record of the proceedings of the board in a book to be provided for that purpose at the expense of the township.

The mayor and aldermen of every city, or the president and council of every incorporated village, in which no board of health is actually organized under the charter, are, by section 1740 of the compiled laws of 1871, as amended in 1879, granted all the powers and required to perform all the duties of a board of health. The amended section 1740 is printed on the following page.

If no health officer is appointed in a township "within thirty days after the annual township meeting," it will still be necessary to appoint or re-appoint one after that time, as in the case of a vacancy; as will also be necessary if the officer appointed does not "qualify," or file his oath of office. Vacancies occur whenever the incumbent of an office ceases to be an inhabitant of the district, county, township, city, or village for which he was elected or appointed an officer,—see section 617, compiled laws of Michigan, 1871.

Before entering upon his duties the health officer should take and subscribe the official oath required by Sec. 1, Art. xviii., of the Constitution of this State, and file the same in the office of the clerk of the city, village, or township of which he is the health officer.

Some of the powers and duties of local boards of health are specified in Chapter 46 of the compiled laws of Michigan, 1871. This chapter was constructed more particularly with reference to township boards of health, but section 49 of the same chapter (chapter 35 of the Revised Statutes of 1846, and chapter 46 of the compiled laws of 1871) as amended by Act No. 145, Laws of 1879, makes it apply to cities and villages. That section as amended is as follows:

Board of health in cities and villages, who to constitute.

(1740.) SEC. 49. The mayor and aldermen of each incorporated city, and the president and council, or trustees of each incorporated village in this State, in which no board of health is organized under its charter, shall have and exercise all the powers and perform all the duties of a board of health as provided in this chapter, within the limits of the cities or villages, respectively, of which they are such officers. The provisions of this chapter, and the amendments thereto, shall, as far as applicable, apply to all cities and villages in this State, and all duties which are,

Duties of officers and inhabitants of cities and villages.

by the provisions of this chapter, to be performed by the board of health of townships, or by the officers and inhabitants thereof, shall in like manner be performed by the board of health and the officers and inhabitants of such cities and villages, with a like penalty for the non-performance of such duties, excepting in cases where the charters of such cities and villages contain provisions inconsistent herewith.

It is believed that there is nothing in the charter of any city or village in the State that conflicts with the general law which requires the appointment of a health officer by the council acting as a board of health, or by a board of health constituted under some charter provision.

One great object in securing a physician as health officer is to enable each local board of health to lead, and not, as too frequently heretofore, to follow the people in sanitary knowledge and action. As a rule our physicians are our leading sanitarians, and they know much better than other people what are the sources of danger to the public health in their several localities; and, as a rule, they know best how to avoid those dangers. It is, therefore, for the interest of the people to secure the benefits of that knowledge by paying for the services and advice of the best sanitarian, who will usually be the best physician in their locality.

If it is true that responsibilities are in proportion to capacities and powers, then a local board or health, which, as in this State, has almost absolute power, must be held responsible for any sickness or death that might have been prevented by a proper use of its legal powers; and an individual health officer employed and paid for sanitary advice who does not use the sanitary knowledge of which he is possessed, in a way to make it as effective as possible for preventing sickness and deaths in his vicinity, is especially culpable.

Although as "an executive officer of the board" your power and authority to act will be only that given you by your board, as a "sanitary adviser" you should, and doubtless will, have influence in determining the action of your

board, in proportion to your knowledge of sanitary science, and your honest effort for the promotion of the public health.

The health officer should be a physician who has given and will give special study to sanitary subjects, and who is qualified to instruct and advise the local board of health in all matters relating to public health which may come before it. The law provides that he shall be a sanitary adviser of the local board of health. In order that his advice may be had to the fullest extent, it seems necessary that generally the health officer should meet with the local board of health, and the local board of health is authorized to fix his compensation, which should include his services at meetings of the board, compensation for his services in reporting to the State Board of Health, etc. By Sec. 1693, Compiled Laws, 1871 as amended by act No. 202, Laws of 1881, every board of health is empowered to regulate and audit all fees and charges of persons employed by it in the execution of the health laws and of its own regulations, including the salary of the health officer. Such of the charges as are payable by the township must be paid by the township treasurer upon orders signed by the supervisor and clerk. The law gives the board of health the right to audit its own expense accounts, and, in townships, the supervisor and clerk, being members of the board of health, can easily sign the orders on the treasurer.

There are many directions in which you can advise your local board of health how to put forth effort for lessening sickness and deaths within its jurisdiction:—

I. EPIDEMICS SHOULD BE PREVENTED.—This can generally be done, if local boards of health will but act efficiently in studying out and applying methods which are now practicable.

As regards small-pox, the Legislature of 1879 made an additional provision for its restriction, and the first general provision for its prevention, by an act authorizing the board of health of each city, village, and township in the State to offer free vaccination to every child not previously vaccinated, and to all other persons who have not been vaccinated within the preceding five years. This law enables local boards of health better to carry out the recommendation contained in a preamble and resolution of the State Board of Health, adopted in July, 1877, as follows:—

WHEREAS, By means of vaccination and revaccination the people may secure complete immunity from small-pox,—

Resolved, That all local boards of health be advised and requested to direct their health physicians to offer, every year, vaccination with bovine vaccine virus, to every child not previously vaccinated, and to all other persons not vaccinated within five years, without cost to the vaccinated, but at the general expense of the locality, as provided for townships in section 1736, compiled laws, 1871.

The law passed in 1879 is as follows (Act No. 146):—

SECTION 1. *The People of the State of Michigan enact*, That the board of health in each city, village, and township may, at any time, direct its health officer or health physician to offer vaccination with bovine vaccine virus to every child not previously vaccinated, and to all other persons who have not been vaccinated within the preceding five years, without cost to the persons [person] vaccinated, but at the expense of such city, village, or township, as the case may be.

Board of health authorized to furnish vaccination.

Vaccination and revaccination are preventives of small-pox, and if the people are kept thoroughly protected in this way, it is believed that no epidemic of that disease can occur.

A document on the prevention and restriction of small-pox has been published by the State Board of Health, and copies may be had by addressing the Secretary, at Lansing.* But small-pox is not the disease most to be dreaded in Michigan. Ten times as many deaths occur in the State from either scarlet

fever or diphtheria as from small-pox; in some years more than twenty times as many. And while for these diseases we have no such preventive measure as is vaccination for small-pox, they are believed to be as truly preventable by means of isolation of first cases, disinfection of infected material, etc., as is small-pox itself.

Epidemics of communicable diseases can frequently be prevented by restricting outbreaks to the first cases which occur.

II. PROMPT NOTICE OF OUTBREAKS OF DISEASE SHOULD BE SECURED.—For the most effective restriction of *all communicable diseases* one of the first requisites is that your board shall *promptly receive notice of every case* of a communicable disease. The law makes provision therefor; see sections 1734, 1735, 6852, 6853, and 6855, Compiled Laws of Michigan, 1871, and the act printed below (No. 157, laws of 1879), relative to complaints by health officers for failure to report cases of diseases dangerous to the public health. It is especially desirable that the attention of the public in your vicinity be called to the requirements of these sections of the law, and the fact impressed upon the minds of the people that safety from communicable diseases can be secured only by giving prompt notice of the first case and of all cases of any such disease, to the health officer or local board of health, in order that immediate steps may be taken for restricting and suppressing such disease. To complete the provision for such notices is one of the first duties of your board. It is again recommended that your board of health *have a sufficient number of blanks for such notices* for the use of *householders* and *physicians* distributed within your jurisdiction, in order to call attention to the law and secure the material for a complete record in your office and in the office of the clerk of your board. The two sections of law, 1734 and 1735, and summary statements of sections 6852, 6853, and 6855, referred to above, and of Act No. 157, laws of 1879, should be printed on the back of each blank. You can find the form for such blanks for notices on the last leaf of this circular. These blanks can be purchased of W. S. George & Co., of Lansing, for one dollar per hundred.

Act No. 157, laws of 1879, makes it the duty of every health officer of a village or city to give notice, to the prosecuting attorney of the county,† of any failure in householders or physicians to report cases of communicable diseases to the health officer or to the local board of health. The act makes no exceptions on account of any other similar provisions in local charters or ordinances. Omitting the title, the act is as follows:—

SECTION 1. *The People of the State of Michigan enact,* That it shall be the duty of the health officer of each village and city in this State, whenever he shall know, or have good reason to believe that any penalty or forfeiture has been incurred within his city or village, by reason of neglect to comply with section one thousand seven hundred and thirty-four or section one thousand seven hundred and thirty-five of the compiled laws of eighteen hundred and seventy-one, forthwith to give notice thereof, in writing, to the prosecuting attorney of his county, which notice shall state, as near as may be, the time of such neglect, the name of the person incurring the penalty or forfeiture, and, as near as can be ascertained, the name or names of persons sick with a disease dangerous to the public health, and not reported as the law requires.

Health officer to notify prosecuting attorney of all failures to report.

What notice to state.

* The document has also been stereotyped by the Board, and any number of copies for distribution may be purchased of W. S. George & Co., Lansing, at the following rates, cash to accompany the order:—

100 copies for	$3.00	400 copies for	$7.00
200 " "	4.50	500 " "	8.00
300 " "	6.00	1,000 " "	14.00

[The order should state whether the document is wanted in the English or in the German language.]

† Section 6855, compiled laws of 1871, requires the Prosecuting Attorney to prosecute for any forfeiture within his county.

III. COMMUNICABLE DISEASES SHOULD BE RESTRICTED.—When notice or information of the occurrence of a case of a communicable disease reaches the local board, **the board should act promptly for the restriction of the disease.** To neglect or postpone such action is a great violation of public trust. As so much depends on prompt action on the appearance of the first case of a communicable disease, and in order that no time may be lost, it is the duty of every board of health to make provision for prompt action by its health officer, authorizing and directing him to be prepared at all times, as the executive officer of the board, to take certain action without waiting for a meeting of the board, whenever a case of scarlet fever, diphtheria, small-pox, or other disease dangerous to the public health occurs within its jurisdiction. Some of the duties which the health officer should be directed to perform may be briefly suggested as follows: He should—

1. Promptly verify the reports of cases of scarlet fever, diphtheria, small-pox, or other dangerous disease, and investigate suspected cases which are not reported, so that he may act intelligently.

2. Secure the prompt and thorough isolation of those sick with or exposed to such a disease, and see that such isolation is continued as long as there is any danger of communicating the disease.

3. See that no person suffers for lack of nurses, etc., because of isolation for the public good.

4. In case of an outbreak of small-pox, secure a prompt vaccination of all persons who have been or may be exposed to the disease.

5. Give public notice of infected places, as required by section 1732,* compiled laws of 1871.

6. Notify teachers or superintendents of schools concerning families in which are contagious diseases.

7. Regulate funerals of persons dead from scarlet fever, diphtheria, small-pox, etc.

8. Disinfect rooms, clothing, and premises, and all articles likely to be infected, before allowing their use by other persons.†

9. Give certificates of recovery and of freedom from liability to communicate the disease.

10. Keep his own board of health, and the State Board of Health, constantly informed respecting every outbreak of a disease dangerous to the public health.

A meeting of the board of health should, however, be held as soon as possible on the outbreak of a communicable disease. The local board of health and the physician in charge of cases of such a disease should co-operate for its restriction. The local board of health should especially guard against its spread by cases where no physician is employed.

IV. CASES OF DISEASES WHICH ENDANGER THE PUBLIC HEALTH SHOULD BE RECORDED.—Another duty incumbent upon the local board of health is the

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*Notice of infected places. (1732.) SEC. 41. When the small-pox, *or any other disease dangerous to the public health*, is found to exist in any township, *the board of health shall use all possible care to prevent the spreading of the infection*, and to *give public notice of infected places* to travelers, by such means as in their judgment shall be most effectual for the common safety.

†For methods, see pamphlet entitled "Restriction and Prevention of Scarlet Fever," issued by this Board, reprinted on pages 211-218 of the Annual Report of the Board for 1881; also a document on "Restriction and Prevention of Diphtheria," reprinted on pages 205-210 of the same Report; also a document entitled the "Prevention and Restriction of Small-pox," issued by this State Board of Health, and printed on pages 289-304 of the Report for 1881.

recording of the sickness from communicable diseases, and of the deaths of citizens and persons under its protection; such records to be for local use and also to be reported to this State Board, so that, when grouped with the records of other localities, the conditions may be studied, and new methods of prevention learned from such unhappy experiences which otherwise will continually be repeated.

A form of "Record of Diseases Dangerous to the Public Health" is printed (reduced in size), on page 10 of this Circular [page 271 of this Report.] You can procure printed sheets of such a record, on paper 15½ by 19½ inches, of W. S. George & Co., of Lansing, for eighty cents per quire or three dollars per hundred. If desired, the same dealers will bind them at usual prices.

It is hoped that hereafter you will, as Health Officer, be prepared and make a record of all important facts concerning "diseases dangerous to the public health" which may come under your observation or be reported to you. Aside from the importance of such a local record, it will enable you, when called upon, to make a full report to this State Board concerning cases of such diseases.*

V. MUCH SICKNESS AND MANY DEATHS FROM ORDINARY DISEASES SHOULD BE PREVENTED.—A field of labor, perhaps even wider than that with the communicable diseases, is open to your local board of health, namely, the inauguration of measures for preventing sickness and deaths from the ordinary diseases in this State, a very great proportion of which are now believed by our best sanitarians to be preventable. Some of the prominent measures to be inaugurated are:—

1. More thorough drainage of the soil, especially near dwellings.
2. Better securities against the contamination of the water-supply, particularly in wells, by filth-saturated soil, etc.
3. A strict guard over the purity of the air, and freedom from nuisances and unclean places.
4. Better sanitary and hygienic arrangements and plans in the public schools, and in public buildings and institutions.

In the execution of these measures, much may be accomplished by systematic and thorough inspections, and by published reports of such inspections, which shall attract attention to the subject, give definite knowledge of existing defects, and suggest methods of improvement.

5. TYPHOID FEVER is believed to be a disease often communicated by means of water or milk contaminated with the discharges from typhoid fever patients or with the remains of those who have died from the disease. Hence typhoid fever might often be prevented by a thorough disinfection of such discharges, and by requiring that those who have died from the disease shall be buried entirely away from all sources of water-supply, and by condemning sources of water-supply already thus contaminated.

VI. NUISANCES SHOULD BE ABATED.—While it is not, as many suppose, the first and only duty of a health officer to smell out a cesspool or an offensive privy, he is the one to whom, from his official position and authority, the people properly look to discover and abate any such nuisance. Freedom from such sources of sickness is believed to be one essential condition of good health in a community, and a duly empowered health officer or a board of health

*Act No. 81, Laws of 1873, Sec. 8: "It shall be the duty of the health physician, and also of the clerk of the local board of health in each township, city, and village in this State, at least once in each year, to report to the State Board of Health their proceedings, and such other facts required, on blanks, and in accordance with instructions received from said State Board. They shall also make special reports whenever required to do so by the State Board of Health."

that from any considerations whatever does not do the utmost (and the power of a local board of health under the law is almost absolute) to prevent and remove such unsanitary conditions is guilty of a plain neglect of duty and a violation of official trust. For a valuable discussion of the power of local boards of health in the abatement of nuisances, the reader is referred to a paper on the powers and duties of local boards of health, by Hon. LeRoy Parker of Flint, published in the Report of this Board for 1879, pages 289–300; also a report by Homer O. Hitchcock, M. D., on Slaughter-houses and Rendering establishments, on pages 65–80 of the same Report.

VII. SANITARY INFORMATION SHOULD BE DISSEMINATED AMONG THE PEOPLE.—The local board of health should be a center of sanitary and hygienic intelligence for its locality; its meetings should not be infrequent, and should be so managed as to secure papers or discussions on special subjects and on the application of the principles of sanitary science to the particular sources of danger in the immediate vicinity, and otherwise to encourage progress in sanitary knowledge, among the members of the board as well as among the people. Charged, under an official oath, with the duty of guarding the life and health of fellow-citizens, the duty of members and officers of boards of health to seek out the best that is known in public hygiene and sanitary methods seems to be plain. The best sanitary work cannot be done except by the coöperation of the people with the board of health, and this can be secured when the people are well informed on sanitary subjects; the thorough distribution by local boards of health of all such documents as the one issued by this Board on the Restriction and Prevention of Scarlet Fever and the one on the Restriction and Prevention of Diphtheria will tend to disseminate useful information and greatly decrease sickness from such diseases.*

Many sources of information in sanitary science and public hygiene are now accessible to those who can secure the literature of these subjects. You can doubtless find something of value without great effort. There are now many works on hygiene, and many periodicals devoted to the subject,—several of them giving especial attention to particular branches of the subject. A knowledge of some of the sources of greatest danger to life in this State may be gained by a study of the Registration Reports on Vital Statistics of Michigan, published by the Secretary of State. These are, or should be, in your township library. A few years ago a pamphlet copy of the Public Health Laws of this State was sent to the health officer of each township, to be delivered to the supervisor if no other health officer was appointed. The first eight Annual Reports of this State Board of Health have been sent as issued, and are, or should be, in your township library.

The Annual Reports of the State Board of Health have been sent, year by year, to the health officers whose names and addresses have been returned to this office; but when no return of the name and address of the health officer is received no Report is sent, because it is not known to whom to send the Report.

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* The documents on "Restriction and Prevention of Diphtheria," and on the "Restriction and Prevention of Scarlet Fever," have been revised and reprinted by the State Board of Health, and copies of either may be had by addressing the Secretary, at Lansing; they have also been stereotyped by the Board, and copies of either may be obtained by local boards of health and others of W. S. George & Co., Lansing, Mich., at the following prices, cash to accompany the order:—

100 copies for	$1.75	400 copies for	$4.25
200 " "	2.50	500 " "	4.75
300 " "	3.50	1,000 " "	8.00

The order should state whether they are wanted in the English, the German, or the Dutch language.

You will find something relative to work of local boards of health and health officers on pages 6, 11, 15, 16, 29, and 30 of the First Report (for 1873); on pages xi–xv, xxv, and xxviii–xxix of the Second Report; on pages xliii–xlv and 1–10 of the Third Report; on pages xxxvi, xxxvii, 6, 7, 11–12, 127, 128, 129, and 130 of the Fourth Report; on pages xxxii–xxxv of the Fifth Report (for 1877); on pages ix–xviii and xxiii–xxxiii of the Sixth Report (for 1878); on pages lvii–lxii, 66–80, 291–300, 329, 330–1, 332-4 of the Report for 1879; also on pages xlix–liv, lviii, lxii–lxxii, lxxiii–lxxviii, lxxxiv–lxxxv, of the Report for 1880.

An important means of disseminating information among the people is the promulgation by the local board of health of rules respecting nuisances, sources of filth and causes of sickness, particularly sickness from contagious diseases. Such rules every local board is authorized to make, by sections 1694, 1695, and 1696. A set of rules recommended by the State Board of Health for adoption by local boards, was printed on pages xix-xxii of the Report for 1875. They will probably soon be revised and republished.

Full public notice of such rules as may be adopted from time to time should be given, in accordance with section 1698, Compiled Laws of 1871, which is as follows:

Notice of regulations, how published.

(1698) Sec. 7. Notice shall be given by the board of health of all regulations made by them, by publishing the same in some newspaper of the township, if there be one published therein, and if not, then by posting them up in five public places in such township, and such notice of said regulations shall be deemed legal notice to all persons.

The State Board of Health would be glad to receive copies of rules, regulations, and ordinances, or blank forms adopted by the board of health of any township, city, or village.

VIII. YOUR LOCAL BOARD OF HEALTH HAS TWO KINDS OF FUNCTIONS:—1. To utilize for your own people the sanitary knowledge already accessible, as indicated in sections I., III., V., VI., and VII., and elsewhere in this circular; 2. To add to the general stock of such knowledge. You can make additions to sanitary knowledge by original research, by means of records of experience, including such as may be secured by methods indicated in sections II. and IV. of this circular, by means of vital statistics, which supply an important basis for public hygiene, and by freely reporting to this Board, which will then eventually be able to give to each local board the benefits of the experience of all the others. In order to be able to report to the State Board of Health as the law requires, the local board must collect facts. If the local board does not receive notices of cases of communicable diseases, this is, in some degree, its own fault; because the law requires each member of the township board, whenever he shall "have good reason to believe" that a forfeiture from neglect to report any such case has been incurred "forthwith to give notice" to the supervisor; and it is the duty of the supervisor "forthwith to commence and prosecute a suit;" and in cities and villages, the law makes it the duty of the health officer to report to the prosecuting attorney all cases of forfeiture under sections 1734 and 1735; and the prosecuting attorney is required to prosecute for all such forfeitures.

In case any disease appears in your locality as an epidemic, please send a Special Report of the facts to this office as soon as possible.* It is particularly desirable that you study and record the conditions coincident with the rise, progress, and decline of any epidemic. It is hoped that you will correspond

* This is here officially demanded, under the law,—Section 8, act 81, Laws of 1873.

freely with this Board. Whenever there occurs, in your locality, any outbreak of a communicable or preventable disease, it is expected that you will inquire into, study, and record the conditions coincident with the rise, progress, and decline of any such outbreak, and, besides making the local record, be prepared to make a valuable report to this Board. Every such instance of suffering in your locality should be made to yield some valuable data useful for advancing the cause of public health.

By direction of the State Board of Health.

Very respectfully,

HENRY B. BAKER,

Secretary.

RECORD OF CASES OF DISEASES DANGEROUS TO THE PUBLIC HEALTH WHICH HAVE OCCURRED

RECORD NUMBER.	RECEIVED FOR RECORD.			FULL NAME OF PATIENT.	SEX.	Age in Years, last Birthday.	NAME OF DISEASE.
	Month.	Day.	Year.				

IN THE................OF........................, COUNTY OF............................, STATE OF MICHIGAN.

TAKEN SICK.			WHETHER DIED, LIVING, OR RECOVERED.	DATE OF DEATH OR RECOVERY.			PERSONS WHO FURNISHED THE FACTS FOR RECORD.	
Month.	Day.	Year.		Month.	Day.	Year.	NAME.	P. O. ADDRESS.

The reported source of contagion or infection, in each case, was as follows: For the case recorded as No.......it was..............

(Blank sheets of Record, similar to the form here indicated, on paper 15½ by 19½ inches, printed on both sides alike, so that it can be bound in book form, can be procured of W. S. George & Co., Lansing, Mich., for 80 cents per quire, or $3.00 per hundred. If desired, the same dealers will bind them at usual rates.)

HOUSEHOLDER'S or PHYSICIAN'S NOTICE OF A COMMUNICABLE DISEASE.

[Form of Notice recommended by the State Board of Health for the use of Householders and Physicians, in complying with sections 1734 and 1735, Compiled Laws of Michigan, 1871, and section 1740, Compiled Laws, 1871, as amended by Act No. 145, Laws of 1879. See over.]

*To the Clerk or Health Officer of the** .... *of* ...., *County of* ...., *State of Michigan, as Clerk or Health Officer of the Board of Health:*

SIR:—The following persons, within the jurisdiction of your Board, have been taken sick with "diseases dangerous to the public health."†

NAMES OF PERSONS.	SEX.	AGE IN YEARS, LAST BIRTHDAY.	NAME OF DISEASE.	TAKEN SICK.			WHETHER DIED, LIVING, OR RECOVERED.	DATE OF DEATH OR RECOVERY.		
				Month.	Day.	Year.		Month.	Day.	YEAR.

So far as known, the source....of the contagious or infectious cause....of the disease........................as follows: For case No. 1, it was...

The residence of the sick persons above reported is as follows: Of case No. 1, it is at No.. ....street,............; of case No. 2, it is..

This notice is given by..

Dated at No...................................street,.., 188....

* Insert the word *city*, *village*, or *township*.

† Includes Measles, Whooping-cough, Diphtheria, Scarlet Fever, Typhus Fever, Typhoid Fever, Puerperal Fever, Erysipelas, Small-pox, Cholera, etc.

LAWS REQUIRING HOUSEHOLDERS and PHYSICIANS TO REPORT DISEASES.

Sections 1734 and 1735, Compiled Laws of Michigan, 1871, are as follows:—

(1734.) SEC. 43. Whenever any **householder** shall know that any person within his family is taken sick with the small-pox, *or any other disease dangerous to the public health*, he shall immediately give notice thereof to the Board of Health, or to the Health Officer of the township [city, or village*] in which he resides; and if he shall refuse or neglect to give such notice, he shall forfeit a sum not exceeding one hundred dollars.†

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(1735.) SEC. 44. Whenever any **physician** shall know that any person whom he is called to visit is infected with the small-pox, *or any other disease dangerous to the public health*, such physician shall immediately give notice thereof to the Board of Health or Health Officer of the township [city, or village*] in which such diseased person may be; and every physician who shall refuse or neglect to give such notice, shall forfeit, for each offense, a sum not less than fifty nor more than one hundred dollars.†

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* Required in cities and villages by section 1740, Compiled Laws 1871, as amended by Act No. 145, Laws of 1879.

†Supervisors must prosecute for all such forfeitures; township officers must give notice to supervisor; prosecuting attorney to conduct suit if requested; see sections 6852, 6853, and 6855, Compiled Laws of Michigan, 1871. Health officers of villages and cities must notify prosecuting attorney of all violations of this section,—see Act No. 157, Laws of 1879; the prosecuting attorney must prosecute for all such forfeitures incurred within his county,—see section 6855, Compiled Laws of 1871.

Notice of sickness of..........

....

Sick with..........

....

Reported by..........

....

Filed..........

....

[Blank Notices (similar to this and the preceding page) may be obtained of W. S. George & Co., Lansing, Mich., for one dollar per hundred.]

REPORT OF ATTENDANCE AT MEETING OF THE ONTARIO MEDICAL ASSOCIATION HELD IN TORONTO JUNE 7 AND 8, 1882.

BY JOHN AVERY, M. D., MEMBER OF THE STATE BOARD OF HEALTH, AND ITS DELEGATE TO SUCH MEETING.

In compliance with an invitation from the secretary of the Ontario Medical Association, and by permission of this Board, I attended the second annual meeting of the Ontario Medical Association, held at Toronto on June 7 and 8. At the same time, by invitation of the president of the Provincial Board of Health of Ontario, I attended the first regular meeting of that board held after its full organization. This board is organized under an act of the last Ontario parliament copied largely from the act under which our own board is organized. Its powers and duties are similar to ours. It is our nearest neighbor and keeps watch over a country that has almost unrestricted intercourse with our State. Its members are gentlemen of culture and are heartily in earnest in their efforts to make the influence of their board felt in lessening preventable diseases in the Province, and to prevent their spread into neighboring States. A community of interests unites them to us. An interchange of official and personal courtesies has already grown into friendships that can hardly fail to be both pleasant and profitable in all future relations between the two boards.

The items of business considered at this meeting of the provincial board were the subject of immigrant-inspection and the inauguration of a system of weekly reports of diseases in the Province. The board was unanimous in a desire to coöperate to the full extent of its powers with the national, State, and local boards of health of this government to prevent the introduction and spread of contagious diseases by immigrants arriving in or passing though the Province of Ontario. In this, however, as in all matters pertaining more directly to the prevention and spread of diseases in the Province they found themselves crippled in their action for the want of well organized and efficient local boards of health. Additional legislation for the organization of these local boards will be needed before the Provincial board can render any efficient aid in the suppression of disease. This in due time will be supplied, together with such other measures as the experience of the board shall deem necessary or wise. In the meantime the board will appoint its corps of correspondents

throughout the province, and begin the work of collecting statistics and receiving and tabulating weekly reports of diseases. Already it is in receipt of a large amount of correspondence asking advice as to the best methods of dealing with local epidemics, and it has prepared for distribution a small document, giving this information in a plain and concise form.

The Ontario Medical Association, composed of a large body of intelligent medical gentlemen from different parts of the Province, was presided over by Dr. Covernton, of Toronto, who by the way is a member of the Provincial board of health. The doctor in his opening address made an eloquent plea for the profession throughout the Province to come to the aid of the Provincial board of health in its work of preventing and restricting disease. He urged the necessity of the organization of local boards of health and the appointment of intelligent and efficient health officers in every municipality as the best means through which this work could be accomplished. He gave a sketch of the work accomplished and proposed by the Provincial board of health, and concluded a thoughtful and well considered address by references to the evidences of progress in scientific medicine, especially in that department relating to the prevention of disease.

It is gratifying to have the evidence of a growing interest in all matters relating to State and preventive medicine as set forth in the number and character of the papers having especial reference to that subject, and the intelligent discussion which these papers called forth.

Besides the President's address, which was an eloquent and forcible plea for preventive medicine as the highest and grandest work of the physician, there was a paper entitled "Local boards of health," by Dr. Yeomans, of Mount Forest, a member of the Provincial Board of Health; one by Dr. Playter, setting forth the importance of, and suggesting the means for, the collection of vital statistics in the Province, under the direction and authority of the Provincial Board of Health; another by Dr. Palmer, of Toronto, on "Hygiene of the Eye in Public Schools." These papers all gave evidence of careful study of their respective subjects, and each called forth an interesting discussion, though the time for discussion was somewhat limited owing to the large number of papers presented.

The local press of the city report that "Dr. Avery, delegate from the Michigan State Board of Health, was present and addressed the association. He referred to the work done by the Michigan State Board of Health,—their efforts and success in interesting the people in sanitary work by means of sanitary conventions held in different parts of the State, in which the public were invited to take part,—and he spoke of the fraternal regard in which the association he had been appointed to visit was held by the profession in his State, and particularly by the Board he was authorized to represent."

Later on, during the discussion of Dr. Playter's paper, I gave in brief the method employed by the Michigan State Board of Health to collect reports of prevailing diseases, by means of postal cards furnished to regular correspondents appointed by the Board.

During the afternoon session of the last day of the meeting of the association, I introduced the following resolution, which was seconded by Dr. McDonald, of Hamilton, and unanimously passed by the association:

Resolved, That this association approves of the decision of the Provincial Board of Health of Ontario to co-operate, to the full extent of its powers, with the National, State, and local boards of health in the United States and in the Dominion of Canada, in the attempt to prevent the introduction and spread of small-pox, by the inspection and vaccination of immigrants, and the disinfec-

tion of baggage and clothing, and by notification to all boards of health interested in the entry or proposed entry within their jurisdiction of immigrants suspected of carrying with them the germs of any disease dangerous to the public health. That in this attempt to lessen the spread of small-pox and other communicable diseases on this continent it is desirable that all health officers and boards of health, under whatever governmental control, shall earnestly and faithfully co-operate; and to secure this co-operation at the earliest possible date, we bespeak and invite the individual efforts of every member of this association.

Thursday afternoon I attended, by invitation of Dr. Oldright, the convocation of the University of Toronto, and witnessed the ceremony of conferring the degrees upon the successful students of the different graduating classes. Each student, as well as every member of the faculty, was dressed in gown and cap, and upon being presented to the chancellor kneeled before him, was briefly and kindly complimented for the honors he had won, and received his degree. In the evening I attended the annual convocation dinner, and thus ended a very pleasant visit to the Dominion of Canada.

All of which is respectfully submitted. JNO. AVERY.

REPORTS BY THE COMMITTEE ON POISONS, EXPLOSIVES, ETC.

BY ARTHUR HAZLEWOOD, M. D., OF GRAND RAPIDS, COMMITTEE OF THE STATE BOARD OF HEALTH.

REPORT OF THE SAVING OF TWO PERSONS POISONED BY OPIUM.

[The following letter from Dr. C. W. Marvin, of Ithaca, Mich., was referred to Dr. Hazlewood, Committee of the Board of Health on Poisons, Explosives, etc.]

HENRY B. BAKER, M. D., *Secretary State Board of Health.*

DEAR SIR:—In cases of poisoning with morphine or opium allow me to say:

In two special cases external friction was so successful that I am induced to give you the notes of them, so that if you wish you may give the same to the public through your Board.

The first case was some ten or twelve years ago. I was called to see F—— B——, about five years of age. An elder brother had been sent to the drug store for ten cents' worth of quinine, but he called for morphine, and the druggist not labeling, the mother divided it into three powders and gave one, and in two hours gave a second one. In about an hour the boy was found to be in a comatose condition, and could not be aroused. In about one-half an hour I saw him; pulse about 40 per minute; frothing at the mouth; pupils contracted to the size of a pin-head and insensible to light; breathing could be heard several rods; jaws set; could not swallow. I at once resorted to friction by rubbing, and then went to slapping the bare knee, and so hard that the red came to the surface in a few minutes, and I felt a flinch or slight twich. I kept up the active slapping, and soon the lad cried out, "You hurt me," and he was able to swallow strong coffee. The comatose condition would return in about two minutes, requiring the same active measures for some 12 hours, and in 24 hours he was as well as ever. I estimated that he must have taken over two grains of morphine.

The second case was a few weeks ago. Mrs. G——, a young married woman, took what the family said was a tablespoonful of coarsely-pulverized opium. In about three hours I saw her; jaws set; breathing two or three times a minute; pupils contracted and insensible to light; could not swallow; I pried open the jaws, but could not induce deglutition; rigidity of the whole system. Remembering the success with friction, I procured a stiff hair brush and began to slap the bare knee with force and rapidity, and in about five minutes the eyes showed some sensibility to light, and there was a slight twiching of the muscles of the leg, and in a few minutes she spoke out, "You are burning me up." We found she could swallow coffee, and took five drops of fluid extract of belladonna. The brush had to be used for some 12 hours to keep her awake, and the next day she was around the house.

I am of the opinion that both of these cases would have died had not the severe friction been resorted to.

The plan is so simple, and at the command of everyone that may know it, that good will, I trust, result from the publication.

Very respectfully, etc.,

Ithaca, Mich., Nov. 7, 1882. C. W. MARVIN.

REPORT BY DR. HAZLEWOOD.

GENTLEMEN OF THE STATE BOARD OF HEALTH:—

The communication referred to me from C. W. Marvin, M. D., of Ithaca, Mich., relating to the action in two cases of opium-poisoning, though interesting as cumulative evidence of what persistent effort will do, offers no new plan of treatment for such cases, yet opens the question as to the advisability of this Board preparing a circular, giving the antidotes and best means of treatment for the more common accidents by poisoning, with different substances to be found under ordinary circumstances. To open the subject for discussion I move that a committee of two be appointed, to draft a circular, for public distribution, which shall embody in a short form, the prominent symptoms and approved antidotes and management for cases of poisoning, arising from opium and other narcotics, and irritant poisons generally.

[The motion of Dr. Hazlewood prevailed, and a committee was appointed to draft a circular on hints in cases of poisoning.—H. B. B., Sec. S. B. of H.]

REPORT ON SUSPECTED LEAD-POISONING FROM USE OF A NURSING-BOTTLE.

[The following is from a letter received from G. G. Gordon, M. D., of Swartz Creek, Mich., which was referred to Dr. Hazlewood.]

Do you know anything of the "M—— feeding-bottle?" If not will you slip into a drugstore and examine one, and give me your opinion as to whether lead-poisoning might result from the use of them. I have a case I diagnose as lead-colic, where they used this bottle. They were neat beyond any question. I stopped the use of the bottle in another family, and have reason to suspect that the child in this case was beginning to suffer from its use. I have also some knowledge of a case which died, in which there is reason to suspect this was the cause.

G. G. GORDON.

REPORT BY DR. HAZLEWOOD.

TO THE STATE BOARD OF HEALTH—GENTLEMEN:—The accompanying letter of Dr. G. G. Gordon, of Swartz Creek, is herewith returned.

I have examined the M—— feeding-bottle referred to, and find that as a whole the bottle has some merits, but has one serious defect. The tube being entirely of soft rubber, requires a sinker to hold it near the base of the bottle. The maker evidently intended that the sinker—the objectionable portion made of lead or soft pewter—should be entirely covered with rubber; in fact, however, it is only imperfectly covered. Provided this sinker was made of unobjectionable material, I think the bottle would offer some advantages over others—especially in the facility with which it may be cleansed.

I recommend that the Secretary send to the maker, informing him of the pernicious character of the sinker used, and self-interest will dictate the best remedy.

Respectfully, A. HAZLEWOOD,
Com. Poisons, etc.

[In accordance with the recommendation of Dr. Hazlewood, a letter was addressed to the manufacturer of the nursing-bottle referred to, and following is his reply]:

H. B. BAKER, M. D., *Secretary State Board of Health:*

DEAR SIR:—Yours of April 17, 1882, in relation to the sinker of the M—feeder is received. In reply will say my aim has been to make as near as possible a perfect feeder. The part you speak of is not lead but pure tin. At least I bought the pure block tin and paid for having it molded, so believe I am correct. The fact of the metal looking black I suppose comes from the action of heat and sulphur in the process of vulcanizing. I have consulted with our physicians here, in fact did before using the tin. They told me that pure tin could do no harm. Previous to that I was using glass, but

adopted tin not to save expense but to prevent breaking of the bottle. However, I have not used the metal drop for the past two months, but have gone back to the glass drop, one of which I enclose. I have never received but one complaint about the metal and that from a dealer in Hartford, Conn., and last week I received an order from a druggist in that city specifying the metal drop. I am very much obliged for your suggestion and will put no more metal or tin sinkers in the market.

[The sinker received from Dr. Gordon was undoubtedly lead; and it is gratifying to know that no more will be manufactured.—H. B. B., Sec. S. B. of H.]

DR. HAZLEWOOD'S REPORT ON STEAM BOILER EXPLOSIONS.

Gentlemen of the State Board of Health:—The subject of steam boiler explosions referred to me I have taken under consideration. Not being an expert nor even well acquainted with boilers, either in their construction or management, I feel very diffident in making any report on the subject. In looking over files of the Scientific American I find the following pertinent remarks: "The percentage of active steam-boilers that violently explode with fatal effect is not at any time very large. Statistics show that there is but about one in 2,000 annually of those in use in England." Few persons, therefore, have had an opportunity of studying the causes of these explosions, and fewer yet who from previous experimental knowledge can form a theory or even give a plausible explanation of the cause of any given disaster; more especially as those engaged about the boiler at the time of the accident are either killed or maimed so as to be unable to give an account, or if unhurt are so much interested in proving that the accident was unavoidable by any action of theirs as to make their statements unreliable.

Many of the cases that have been examined show faults of construction originally, also too long a use, and perhaps as often as any, inattention, either from ignorance or willful neglect, safety valves being allowed to become rusted so that no power short of an explosion would loosen them from their sockets. Mr. Lawson's theory of the causes of explosions, so far as I can judge, appears to be based upon truthful observation. The fact that water under pressure of confinement becomes heated to a greater degree before giving off steam than it does when boiled in the open air, and when this pressure is suddenly taken off, the water, in one sense superheated, violently assumes the form of vapor and of course subjects the boiler to a sudden and enormous concussion, is a strong deteriorating force, which added to the ordinary wear, together with frequent faults of construction and material, and sometimes chemical action of the water used, make it rather a wonder that explosions are not more frequent than they are.

Mr. Lawson proposes, as a remedy, to construct boilers with a diaphragm perforated with small holes and valves, the aggregate area of which shall be less than the port hole or valve though which the cylinder is supplied with steam. He claims for this form of construction that the pressure under which steam is generated will be uniform, although the liberation of steam from the partially separated chamber above the water may be intermittent, and thus prevent the sudden loss of pressure upon the water by the escaped steam. To prevent the condensation of steam attendant upon its contact with cold water, he proposes that the colder feed-water shall enter the boiler in such a manner by downward injection that it shall by no means come in contact with the steam, but mingle with the water in the boiler under the surface of the same.

Whilst this theory of construction, as a remedy, seems to appear probable,

it will be wisdom on our part to await the tests and examinations of practical engineers, as well as further time, the great prover and disprover of theories, before a formal decision is made.

In view of the many accidents which to all appearances arise from neglect, especially of valves, the following instructions recently issued by the Manchester Steam-Users' Association, merit careful consideration.

"INSTRUCTIONS TO BOILER-ATTENDANTS, ON THE CARE OF STEAM BOILERS.*

Getting up steam.—Warm the boiler gradually. Do not get up steam from cold water in less than six hours. If possible, light the fires over night. Nothing turns a new boiler into an old one sooner than getting up steam too quickly. It hogs the furnace tubes, leads to grooving, strains the end plates, and sometimes rips the ring seams of rivets at the bottom of the shell.

Firing.—Fire regularly. After firing open the ventilating grid in the door for a minute or so. Keep the bars covered right up to the bridge. Keep as thick a fire as the quality of the coal will allow. Do not rouse the fires with a rake. Should the coal cake together, run a slicer in on the top of the bars and gently break up the burning mass. It has been found by repeated trials that under ordinarily fair conditions no smoke need be made with careful hand-firing.

Cleaning fires and slacking ashes.—Clean the fires as often as the clinker renders it necessary. Do not slack the clinkers and ashes on the flooring plates in front of the boiler, but draw them directly into an iron barrow and wheel them away.

Feed water supply.—Set the feed valve so as to give a constant supply, and keep the water up to the height indicated by the water level pointer. There is no economy in keeping a great depth of water over the furnace crowns, while the steam space is reduced thereby, and thus the boiler rendered more liable to prime. Nor is there any economy in keeping a very little water over the furnace crowns, while the furnaces are thereby rendered more liable to be laid bare.

Glass water-gauges and floats.—Blow through the test tap at the bottom of the gauge hourly, as well as through the tap in the bottom neck, and the tap in the top neck twice daily. These taps should be blown through more frequently when the water is sedimentary, and whenever the movement of the water in the glass is at all sluggish. Should either of the thoroughfares become choked, clean them out with a wire. Work the floats up and down by hand three or four times a day to see that they are quite free. Always test the glass water-gauges and the floats thoroughly the first thing in the morning before firing up.

Blow-out taps and scum-taps.—Open the blow-out tap in the morning before the engine is started, and at dinner time when the engine is at rest. Open the scum-tap when the engine is running, before breakfast, before dinner, and after dinner. If the water be sedimentary, run down half an inch of water at each blowing. If not sedimentary, merely turn the taps round. See that the water is at the height indicated by the water level pointer at the time of opening the scum tap. Do not neglect blowing out for a single day, even though anti-incrustation compositions are put into the boiler.

Safety-valves.—Lift each safety-valve by hand in the morning before setting to work to see that it is free. If there is a low-water safety-valve, test it

*Sheet of Instructions to boiler attendants recently issued by the Manchester Steam-User's Association.

occasionally by lowering the water-level to see that the valve begins to blow at the right point. When the boiler is laid off, examine the float and lever and see that they are free, and that they give the valve the full rise. If safety-valves are allowed to go to sleep, they may get set fast.

Shortness of water.—In case the boiler should be found to be short of water, draw the fires, if practicable, and draw them quickly, beginning at the front. In some cases it may be more convenient to smother the fires with ashes, or with anything else ready to hand. If the fires are not drawn, leave the furnace-doors open, turn on the feed, lower the dampers, shut down the stop-valve if the boiler be one of a series, and relieve the weight on the safety-valves so as to blow off the steam. Warn passers-by from the front of the boiler.

Use of anti-incrustation compositions.—Do not use any of these without a thorough knowledge of their effects. If used, never introduce them in heavy charges at the man-hole or safety-valve, but in small daily quantities along with the feed-water.

Emptying the boiler.—Do not empty the boiler under steam pressure, but cool it down with the water in; then open the blow-out tap and let the water pour out. To quicken the cooling the damper may be left open, and the steam blown off through the safety-valves. Do not on any account dash cold water on to the hot plates. But, in cases of emergency, pour cold water in before the hot water is let out, and mix the two together so as to cool the boiler down gradually and generally, and not suddenly and locally.

Cleaning out the boiler.—Clean out the boiler at least every two months, and oftener if the water be sedimentary. Remove all the scale and sediment, as well as the fine dust and soot. Show the scale and sediment to the manager. Pass through the flues, and see not only that all soot and flue-dust have been removed, but that the plates have been well brushed. Also see whether the flues are damp or dry, and if damp, find out the cause. Further, see that the thoroughfares in the glass water-gauges and in the blow-out elbow-pipes, as well as the thoroughfares and the perforations in the internal feed dispersion-pipe and the scum-pipes are free. Take the feed-pipe and the scum-troughs out of the boiler if necessary to clean them thoroughly. Take the taps and the feed-valves to pieces; examine, clean, and grease them, and, if necessary, grind them in with a little fine sand. Examine the fusible plugs. Do not put any blocks under the pipes in the hearth-pit.

Preparation for inspection,—Have the boiler cooled and carefully cleaned out as explained above. Show both scale and sediment to the inspector, as well as the old cap of the fusible plug, and tell him of any defects that may have manifested themselves in working, and of any repairs or alterations that may have been made since the last examination.

Fusible plugs.—Keep these free from soot on the fire side, and from incrustation on the water side. Change the fusible metal once every year, at the time of preparing for annual examination.

General keeping of boiler.—Polish up the brass and other bright work in the fittings. Sweep up the flooring-plate frequently. Keep water out of the hearth-pit below the flooring-plates. Keep the space on top of the boiler free, and brush it down once or twice a week. Take a pleasure in keeping the boiler and the boiler-house clean and bright, and in preventing smoke.''

Respectfully submitted,

A. HAZLEWOOD, *Committee.*

DISEASES IN MICHIGAN IN THE YEAR 1881.

A SUMMARY FOR THE STATE, COMPILED IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH, FROM REPLIES* BY REGULAR CORRESPONDENTS OF THE BOARD.

The study of diseases occurring in Michigan, by means of compilations of replies from selected correspondents has been a feature of the work of this Board for the years 1875, 1876, 1877, 1878, 1879, 1880, and 1881. For the year 1881 the circular to which these replies were made was issued in January, 1882, and was quite similar to the one for the preceding year. This similarity enables us to secure statistics upon given points for a series of years. On pages following, the questions in the circular are printed, in finer type, and each question is followed by a summary of the replies to it. Replies to the circular were received from 44 correspondents representing 42 localities. The replies are printed in full, following the summary. It is hoped more of the correspondents of the Board will record observations, during the year, in order to enable them to make their replies more complete and valuable. Much credit is due, and hearty thanks are tendered, to the correspondents from whose valuable replies for 1881, this compilation is made. The circular and the summary are as follows:—

CIRCULAR TO CORRESPONDENTS, RELATIVE TO DISEASES IN MICHIGAN IN 1881.

[50.]

OFFICE OF THE STATE BOARD OF HEALTH,
LANSING, MICHIGAN, *December*, *1881.*

To the Correspondents of the State Board of Health,—

GENTLEMEN:—This Board desires to have, and to place upon record for purposes of future study and comparison in connection with records of deaths and of meteorological conditions, statements for as many different localities in the State as possible of the diseases in Michigan during the year 1881. Will you have the kindness to send, as soon as is convenient, and on this sheet, your replies to the following questions? So far as exact and generally accepted common terms can be used, it is desirable to avoid the use of technical terms. Please use the stamped envelope enclosed herewith, and leave all additional postage to be paid at this office. In replying, it is desired that you fill the blanks in this Circular; if the blank space is not sufficient for your answer, please refer to and use an extra sheet, referring to the question by number.

1. If you live in a city or incorporated village, what do you estimate the number of inhabitants of said city or village at the middle of the year 1881?
2. Among these inhabitants above mentioned, what do you estimate the number of deaths from all causes during the year 1881?

* The replies are printed in full on pages immediately following the summary.

THE ESTIMATED DEATH-RATE IN MICHIGAN, IN 1877-81.

While questions 1 and 2 were asked with reference to cities and villages, where it is supposed the population and number of deaths could be more accurately determined, still the replies include some townships, while some include the township and the village located in it. Replies were received to question 1, giving a known or estimated population, from 11 cities (1 including the township), 22 villages (2 including the township and 2 being unincorporated), and 1 township. Replies to question 2, giving a known or estimated number of deaths, from 11 cities, 20 villages, and 1 township: Replies were received to both questions 1 and 2, from 11 cities, 19 villages, 1 township. From these 31 localities, having a known or estimated population of 241,584, a total number of 4,524 deaths were reported, which would make an annual death-rate of 18.74 in 1,000 inhabitants. The highest death-rate was at Otisville, being 40, and the lowest was at Gaines, being but 1.8. It is believed the exceedingly high death-rate at Otisville in 1881 was due to the deaths from diphtheria. The following table gives a comparative exhibit of the death-rates as reported for the years 1877-1881.

TABLE—*Exhibiting the Estimated Population, the Estimated Number of Deaths, the Average, Highest, and Lowest Death-rates, and the Number of Localities in Michigan Represented by Replies from Correspondents for the Years 1877, 1878, 1879, 1880, and 1881:*

	Years.				
	1877.	1878.	1879.	1880.	1881.
Number of localities represented..	28	39	23	26	31
Total estimated population..........	218,980	285,867	202,329	210,176	241,584
Estimated number of deaths........	3,393	3,749	3,272	3,430	4,524
Average deaths per 1,000 persons...	15.50	13.10	16.17	16.32	18.74
Highest death-rate reported*........	40.00	25.00	33.33	25.00	†40.00
Lowest death-rate reported*........	1.00	3.70	3.33	2.50	1.8

* Number of deaths in each year in each thousand persons living.
† Death-rate large because of diphtheria.

A reply to these questions was received from the Michigan Asylum for the Insane, at Kalamazoo, where among 690 inmates there were 58 deaths in 1881, making a death-rate of 84.06 in 1,000 living. As it seems improper to include a death-rate from so large a hospital with this statement for so small a proportion of the people of the State, it is omitted from the preceding table and statements. If the 241,584 inhabitants included in the table are a fair sample of the inhabitants of the State, the death-rate shown (18.74 to each 1,000 living), though greater than in preceding years, is still not so great as in most other parts of the world where the death-rate is ascertained. Including the death-rate at the Kalamazoo Asylum, the death-rate in 1881 for all localities heard from was 18.92 per thousand living.

TABLE—*Exhibiting Names of Localities from which Replies to Questions 1 and 2 were Received, the Estimated Population, the Number of Deaths Reported, and the Average Deaths per 1,000 Persons Living, for each Locality, for the Year 1881:*

DIVISIONS AND LOCALITIES.*	City, Village, or Township.	Estimated Population.	Deaths Reported.	Deaths per 1,000 Persons.
UPPER PENINSULAR DIVISION.*				
Hancock	Village and Township	3,500	42	12.
WESTERN DIVISION.*				
Muskegon	City and Township	14,400	325	22.6
BAY AND EASTERN DIVISION.*				
St. Clair	City	2,000	22	11.
CENTRAL DIVISION.*				
DeWitt	Village	384‡	2	5.20
Gaines	Village	550	1	1.8
Hastings	City	2,700	80	§29.63
Linden	Village	700	5	7.1
Otisville	Village	500	20	§40.
St. Johns	Village	2,500	55	22.
Stanton	City	2,500	21	8.4
Webberville	Village	500	10	20.
SOUTH-WESTERN DIVISION.*				
Allegan	Village	3,000	50	16.66
Bangor	Village	1,400	----	----
Dayton	Village	300	----	----
Niles	City	4,400	55	12.5
Niles	City	4,200	70	16.7
Otsego	Village	1,000	11	11.
Pokagon	Village	300‡	2	6.66
St. Joseph	Village	2,700	33	12.2
CENTRAL DIVISION.*				
Grass Lake	Village and Township	2,500	----	----
Hillsdale	City	4,000	48	12.
Jackson	City	17,000	226	13.3
Kalamazoo	Village	14,000	311	22.2
Kalamazoo, *Asylum for the Insane*	Asylum	†690	56	34.6
Manchester	Village	1,150	16	13.9
Mendon	Village	1,000	10	10.
Tecumseh	Village	2,400	50	20.83
Three Rivers	Village	3,000	21	7.
Union City	Village	1,300	18	13.85
Union City	Village	1,500	21	14.
Vicksburg	Village	800	15	18.75
Ypsilanti	City	6,000	50	8.33
SOUTH-EASTERN DIVISION.*				
Detroit	City	140,000	2,900	20 71
Dearbornville	Village	----	‡25	----
Northville	Village	1,000	12	12.
Pontiac	City	4,500	63	14.
Wyandotte	City	4,000	50	12.50

* For counties in each division, see Exhibit 1, page 287.
† Patients.
‡ Unincorporated villages.
§ Death-rate large because of diphtheria.

3. Please state the territory for which your replies to the following questions are made.

The 43 replies include observations from 11 cities, 24 villages, 39 townships and 1 asylum for the insane. Many of the replies from cities and villages include a radius of several miles without naming the townships. The territory represented is situated in 25 counties and in 7 geographical divisions of the State. A list of these divisions with the counties in each division is printed in Exhibit 1, page 287.

SICKNESS IN 1881, AS COMPARED WITH 1880 AND 1879.

4. Among the people of your locality, considering the increase or decrease of population, was the amount of *sickness* from all causes during the year ending December 31, 1881, *greater*, *less*, or *about the same as the average* during previous years? If not the same, how much was it increased or diminished?

To this question 42 correspondents replied. Eighteen reported that they thought the sickness had increased, seven that it had decreased, and seventeen that it was the same. Of the eighteen who reported an increase, one said 5 per cent; one, 10 per cent; one, 15 per cent; two, 20 per cent; four, 25 per cent; two, 33⅓ per cent; two, 50 per cent; one, 75 per cent; and three 100 per cent; an average of 41.9 per cent increase; one, reported the sickness "slightly increased."

Of the seven who reported the sickness decreased, one said that it was 7 per cent less; one, 50 per cent less; one, "very little less;" one, "greatly decreased;" one, "considerably less;" one, "slightly less," and one simply "less." Comparing the year 1881 with other years:—Of the correspondents who replied to this question for each year mentioned, the proportion which reported a decrease of sickness was,—in 1879, 39 per cent; in 1880, 20 per cent; and in 1881, 17 per cent: the proportion which reported the amount of sickness about the same as in previous years was,—in 1879, 33 per cent; in 1880, 59 per cent; in 1881, 40 per cent: the proportion which reported an increase of sickness was,—in 1879, 29 per cent; in 1880, 20 per cent; and in 1881, 43 per cent. The average per cent by which the sickness was reported increased was,—in 1879, 28.6 per cent; in 1880, 34.6 per cent, and in 1881, 41.9 per cent.

From these figures it would seem that there was more sickness in Michigan in 1881 than in 1880 or in 1879. The diseases which caused this increased sickness are specified in the summary of replies to question 6, diphtheria being the most important one, and typhoid fever being the next most important.

DEATH-RATE IN 1881 COMPARED WITH PREVIOUS YEARS.

5. Compared with previous years, and from all causes, was the ratio of deaths to inhabitants during the year 1881 *greater*, *less*, or about *the same as the average*? If not the same, how much was it increased or diminished?

Forty-one correspondents replied to this question. Eighteen reported the ratio of deaths to inhabitants was the same as the average in previous years. Seventeen reported it greater, and six reported it less. Of those who reported it greater, one said it was greater by .4 per cent; one, .5 per cent; one 15 per cent; one, 20 per cent; three 25 per cent; two 33⅓ per cent; one, 40 per cent; one 100 per cent; two, "more than 100 per cent;" three, "greater;" one, "slight increase." Of the six who reported a decrease, one said 8 per cent; one, 20 per cent; one, 4 or 5 per 1,000; one "greatly decreased;" and two, simply "less." It will be seen that nearly three times as many reported the ratio of deaths increased as reported it decreased.

DISEASES MORE THAN USUALLY PREVALENT IN 1881.

6. What diseases, or causes of death, were *more* prevalent in 1881, than usual in previous years?

Forty-three correspondents replied to this question. Five replied that no disease was more than usually prevalent. By the other 38 correspondents who replied to the question, the following diseases and causes of death were reported more than usually prevalent in 1881:—

Diphtheria, by 14; typhoid fever, by 11; typho-malarial fever, by 9; measles, by 6; consumption, pneumonia, remittent fever, and scarlet fever, each by 4; cerebro-spinal meningitis, cholera infantum, and pharyngitis, each by 3; cholera morbus, "contagious diseases," old age, and whooping-cough, each by 2; bronchitis, diarrhea, dysentery, intermittent fever, influenza, rheumatism, tonsilitis, catarrhal fevers, "more old people broken down," pulmonary

affections, "congestive," malarial influences, malaria, "diphtheritic croup in winter and spring," each reported by one.

In 1877, 6 correspondents reported diphtheria as a disease of increased prevalence; in 1878, 15; in 1879, 8; in 1880, 6; in 1881, 14. Scarlet fever was reported as being of increased prevalence, in 1877, by 6; in 1878, by 6; in 1879, by 2; in 1880, by 5; and in 1881, by 4.

A tabular view of the replies to this question is given in Exhibit 2, on pages 188 and 289.

7. **If you can assign any *cause* for the *unusual prevalence* of any disease, please do so.**

Thirty correspondents made replies to this question, which are embodied in Exhibit 2, on pages 288 and 289.

From the summaries of the replies to questions 6 and 8, it may be seen that the greater part of the increased sickness in 1881 was reported to have been caused by diphtheria, typhoid fever, and typho-malarial fever,—there being, after subtracting the number who reported a decrease, a balance of about one-fourth or one-third of the correspondents who replied to these questions who reported an increased prevalence of these diseases. By referring to the third column in Exhibit 2, pages 288–9, it may be seen that the causes of the increase of those diseases appear to have been: for diphtheria, exposure to the extremes of temperature and to the contagion of that disease, by one observer attributed to "a disbelief in contagion"; and for the fevers, wet weather in Spring, extremely hot weather in Summer, and warm and wet Fall.

8. **What diseases, or causes of death, were *less* prevalent in 1881 than usual in previous years?**

Thirty-five correspondents replied to this question, of whom 10 said no disease was less prevalent in 1881 than in former years. Of the 24 by whom some disease or cause of death was reported of lessened prevalence,—malarial diseases were reported by 6; measles and scarlet fever, each by 4; diphtheria by 3; contagious diseases, diarrhœa, and dysentery, each by 2; cholera infantum, intermittent fever, typho-malarial fever, pneumonia, small-pox, "all diseases," "all except malarial fever, pneumonia, and consumption," "less remittents and lung troubles in spring and early summer months," bowel complaints, "diseases dependent on malarial and zymotic causes," old age, inflammation of the bowels, and inflammation of the lungs, each by 1. One said they had no epidemic in 1881, and one said there were very few deaths from fevers.

A tabular abstract from the replies is shown in Exhibit 2, pages 288 and 289.

9. **To what do you attribute the lessened prevalence?**

Twenty replies were received to this question, which are abstracted in Exhibit 2, pages 288 and 289.

10. **From what diseases or causes was there *more* than the usual *mortality* during the year 1881?**

Thirty-nine replies were received to this question. Five stated that there was no disease attended with more than the usual mortality. Of those who reported some disease or cause of death as being attended with more than the usual mortality,—diphtheria was reported by 12; typhoid fever and typho-malarial fever, each by 6; cholera infantum and pneumonia, each by 4; consumption by 3; cholera morbus, measles, and scarlet fever, each by 2; bronchitis, cerebro-spinal meningitis, cerebro-spinal paralysis, dysentery, remittent fever, malaria, malarial fevers, bilious fevers, catarrhal fevers, "congestive," heart disease, lung affections, diphtheritic croup, "more old people have died than usual," "infirmities of old age," and old age was reported each by one. A tabular view of the replies to this question is given in Exhibit 3, on pages 290 and 291.

EXHIBIT 1.—*Eleven Geographical Divisions of the State, formed for the purpose of facilitating the Study of Causes of Sickness and of Deaths; with a List of Counties included in each Division.*

Upper-Peninsular.	North-western.	Northern.	North-eastern.	Western.	Northern-Central.	Bay and Eastern.	Central.	South-Western.	Southern-Central.	South-eastern.
Baraga.	Benzie.	Antrim.	Alcona.	Kent.	Clare.	Bay.	Barry.	Allegan.	Branch.	Macomb.
Chippewa.	Gr. Traverse.	Charlevoix.	Alpena.	Lake.	Gladwin.	Huron.	Clinton.	Berrien.	Calhoun.	Monroe.
Delta.	Leelanaw.	Cheboygan.	Iosco.	Mason.	Isabella.	Lapeer.	Eaton.	Cass.	Hillsdale.	Oakland.
Houghton.	Manistee.	Crawford.	Montmorency.	Muskegon.	Mecosta.	Saginaw.	Genesee.	Van Buren.	Jackson.	Wayne.
Isle Royal.	Manitou.	Emmet.	Ogemaw.	Newaygo.	Midland.	Sanilac.	Gratiot.		Kalamazoo.	
Keweenaw.	Missaukee.	Kalkaska.	Oscoda.	Oceana.	Roscommon.	St. Clair.	Ingham.		Lenawee.	
Mackinac.	Wexford.	Otsego.	Presque Isle.	Osceola.		Tuscola.	Ionia.		St. Joseph.	
Marquette.				Ottawa.			Livingston.		Washtenaw.	
Menominee.							Montcalm.			
Ontonagon.							Shiawassee.			
Schoolcraft.										

The replies by correspondents are grouped by geographical divisions of the State, shown in this exhibit, and alphabetically by localities within the divisions. This exhibit is printed here in order to aid in turning to replies from particular localities, without referring to the index, and that reference may readily be made to it by page, from the exhibits which follow.

11. If you can assign any *cause* for the *unusual mortality* from any disease, please do so.

Twenty-five correspondents replied to the question. An abstract of the replies is given in Exhibit 3, pages 290 and 291.

12. From what diseases or causes was there *less* than the usual *mortality?*

Thirty replies were received to this question. Ten said that from no disease or cause of death was there less than the usual mortality. By those who reported some disease as being attended with less than the usual mortality, scarlet fever was reported by 6; malarial diseases by 3; diphtheria, measles, fevers, and bowel complaints, each by 2; bronchitis, cholera infantum, consumption, diarrhea, dysentery, typhoid fever, pneumonia, small-pox, "all diseases," "infectious diseases," "contagious diseases," and lung complaints, each by 1. One could not say. A tabular view of the replies is given in Exhibit 3, on pages 290 and 291.

EXHIBIT 2.—*Indicating by Geographical Divisions of the State, and by Localities, the diseases of Increased and of Lessened Prevalence in Michigan during the Year 1881, and the Supposed Causes of Increased and of Lessened Prevalence,—as Compiled from the Replies by 43 Correspondents to Questions 6, 7, 8, and 9, of Circular 50 from the State Board of Health.*

Divisions* and Localities.	Diseases of Increased Prevalence.	Supposed Causes of Increased Prevalence.	Diseases of Lessened Prevalence.	Supposed Causes of Lessened Prevalence.
All Localities.	See Summary of Replies to Question 6, page 285.	See Summary of Replies to Question 7, page 286.	See Summary of Replies to Question 8, page 286.	
UPPER-PENINSULAR DIV.*				
Delaware Mine	Typhoid fever, cholera infantum.	For chol. morbus, greater rainf'l, followed by very warm days.	Scarlet fever and measles	Died out early in the year and did not reappear.
Hancock	Scarlet fever, measles, bronchitis, typhoid fever, diphtheria, whooping cough.	No.	Diarrhea	Finer weather.
Nonesuch	Typhoid fever	Defective drainage	Cannot say that any.	
WESTERN DIVISION.*				
Muskegon	Malaria, scarlet fever, typhoid fever, and rheumatism.	Extra fall of water coming in contact with sawdust and slabs, undergoing fermenta'n.	Diphtheria.	
BAY AND EASTERN DIV.*				
Brockway Center	Diphtheria		Malarial	Better drainage.
St. Clair	Diphtheria		Scarlet fever	Prompt isolation of the first case.
Thornville	Cerebro-spinal meningitis, some contagious diseases.	None, aside from contact in contagious diseases.	None prominently so.	
CENTRAL DIVISION.*				
De Witt	None		None.	
Hastings	Diphtheria	A wet spring, followed by a hot, dry summer.	Think there was none.	
Linden	Diphtheria, remittent fever, acute pharyngitis, typho-malarial fever.	In diphtheria, a disbelief in contagion, and subsequent carelessness.	Malarial (except remittents.)	Increased virulence of malarial poison, lessened vitality, changing the malarial type to a continued form.
Otisville	Diphtheria and typhoid fever	Atmospheric conditions and other causes more favorable for their development.		
St. Johns	Diphtheria, measles, cholera infantum.	Ext'mes of temp'ture must have been one cause of mortality.		
Stanton	Typho-malarial fever	Cannot	Dysentery, cholera infantum	Do not know.
Webberville	Typhoid fever	No data	None.	
Wood's Corners	Measles, diphtheria, typho-malarial fever, pharyngitis.	Typho-mal. fever by unusual rainfall and evaporation during hot and dry months.		
SOUTH-WESTERN DIV.*				
Allegan	Typhoid or typho-malarial fever		Malarial	Better drainage.
Bangor	Typhoid fever and diphtheria	Fevers caused by unusually dry summer, followed by a warm, wet fall.	None.	
Dayton	None		Diphtheria, diarrhea, dysentery, pneumonia, typho-malarial fever, and all diseases.	To favorable weather for health.
Niles, S. B.	None		Contagious diseases	Sanitary measures taken to prevent.
Niles, I. S.	Typho-mal. and remittent fev'rs, pneumonia, and consumption.	Excessive heat causing a severe type of malarial fevers.	All except malarial fevers, pneumonia, and consumption.	Better management.

Otsego	Bilious remittent fevers and pneumonia.	Fev'rs increased by the long, hot and dry summer and autumn.	Had no epidemic in 1881	Have no theory for this.
Pokagon	Typho-malarial fever and influenza.		Diphtheria, scarlet fever, and measles.	No exposure to contagion.
St. Joseph	Remittent fevers, including under this head all diseases of children not bowel complaints	The unusually hot summer	Intermittent fever	More general cultivation of the soil, better drainage, better houses, and deeper wells.
SOUTH'N-CENTRAL DIV.*				
Grass Lake	Diphtheria, measles, typhoid fever, cerebro-spinal meningitis.	Diphtheria from contagion	Less malarial troubles	Drainage.
Hillsdale	Catarrhal fevers, and consumption (from abroad.)	With catarrhal fevers, very cold winter and early spring.	Very few deaths from fevers	Less precipitation in hot weather.
Jackson	Cerebro-spinal meningitis, chol. infantum, chol. morbus, intermittent fever, and diarrhea.	In cerebro-spi.men., the severity of winter. In other diseases the high temperature of summer with lack of rain.	Less remittents and lung troubles in spring and early summer months.	
Jerome	No special diseases; more old people broken down. Some scarlet fever, measles, and whooping cough.			
Kalamazoo	Diphtheria and typho-malarial fever.	(See Reply.)	Bowel complaints	To the summer drouth late in the season.
Kalamazoo Asylum	Diphtheria, pharyngitis, tonsilitis, dysentery, pneumonia, and consumption.	Overcrowding of the Asylum		
Manchester	Pulmonary affections, cholera morbus, and cholera infantum.	Of pulmonary affect'ns, extreme cold of winter; of choleraic troubles, ext'me heat of sum'r.	None.	
Mendon	Congestion	Cannot	None.	
Tecumseh	None		None.	
Three Rivers	Pneumonia and diphtheria	Severe winter, and most cases old people.	Malarial	Drainage and favorable meteorological changes.
Union City, R. B.	Old age	Cannot say	Cannot say.	
Union City, E. H.	None		Diseases dependent upon malarial and zymotic causes.	Better hygiene, drainage, care of cellars, ventilation and care of person.
Vicksburg	Old age. Four were over 80 y'rs, two 75, three about 60.		Malarial.	
Ypsilanti	Typhoid fever	Cannot.		
SOUTH-EASTERN DIV.*				
Detroit	Scarlet fev., diphtheria, typhoid fever, typho-malarial fever.	Dry weather increased typhoid and typho-malarial fevers.	Small-pox and measles	Vaccination.
Dearborn	Typho-malarial fever	Long continued drouths	Old age, inflammation of bowels and lungs, and all contagious diseases.	Moderate weather without sudden changes, strict compliance of regulations to prevent contagious diseases.
Northville	Malarial influences. Measles.	Measles brought from Holly.		
Pontiac	Increase of deaths among extreme old and young. Contagious diseases.	Extreme heat and unusual prevalence of contagious diseases.	None.	
Walled Lake	Typhoid fever.			
Wyandotte	Diphtheritic croup in winter and spring.		Scarlet fever and measles.	

* For counties included in each division, see Exhibit 1, page 287.

EXHIBIT 3.—*Indicating, by Localities in Michigan, the Diseases from which there was Increased Mortality, the Diseases from which there was Lessened Mortality, during the year 1881, and the Supposed Causes of Increased and of Lessened Mortality,—as compiled from the Replies by 40 Correspondents to questions 10, 11, 12, and 13, in Circular 50, from the State Board of Health.*

Divisions* and Localities.	Diseases of Increased Mortality.	Supposed Causes of Increased Mortality.	Diseases of Lessened Mortality.	Supposed Causes of Lessened Mortality.
All Localities.	See Summary of Replies to Question 10, page 286.		See Summary of Replies to Question 12, page 287.	
UPPER-PENINSULAR DIV.*				
Delaware Mine	Cholera infantum	Cold rains followed by very warm weather	Scarlet fever	Disease not present.
Hancock	Scarlet fever, measles, typhoid fever, diphtheria, bronchitis in children	None	Diarrhea, pneumonia.	
WESTERN DIVISION*				
Muskegon	Scarlet fever	Malaria.		
BAY AND EASTERN DIV.*				
St. Clair	Diphtheria		Scarlet fever	Prompt isolation of first case.
Thornville	Typhoid fever	Protracted drouth and low water	Measles (an extensive epidemic)	Mildness of the disease.
CENTRAL DIVISION.*				
DeWitt	None		None.	
Hastings	Diphtheria	A wet spring followed by a hot and dry summer	None.	
Linden	Diphtheria	Loss of vitality in the respiratory tract, and unusual susceptibility to morbific influences.	None in particular	Diminished severity of most diseases.
Otisville	Typhoid fever and diphtheria.	Conditions of the atmosphere	Cannot say.	
St. Johns	Measles	Cannot give them.		
Stanton	Typho-malarial fever	Cannot give them	Dysentery, cholera infantum.	Do not know.
Webberville	Typhoid fever	Severe type of disease	None.	
Wood's Corners	Diphtheria and typho-mal. fever			
SOUTH-WESTERN DIV.*				
Allegan	Typhoid or typho-mal. fever		Malarial.	
Bangor	Diphtheria, typhoid, or typho-malarial fevers	Dry summer and wet fall.		
Dayton	None.		All diseases.	
Niles S. B.	Consumption	Cannot give them	Scarlet fever and diphtheria	Milder form of diseases
Niles I. S.	Consumption and malaria		Bronchitis and the infectious diseases.	
Otsego	Bilious fevers and pneumonia	Unusual weather	None.	
Pokagon	None.			
St. Joseph	Remittent fever, old age	More old people to die	Scarlet fever, diphtheria, consumption.	Absence of contagion in first two, and mild, humid air in third.
SOUTHERN CENTRAL DIV.*				
Grass Lake	Diphtheria, cerebro-spinal paralysis	Diphtheria malignant in form	None.	
Hillsdale	Catarrhal fevers	None	Perhaps fevers	Clean streets and pure water.

Jackson	Cerebro-spinal meningitis, cholera morbus, cholera infantum.	Severe type of disease, the severe cold of winter having rendered vital endurance less		
Jerome			Fevers	Cannot say why.
Kalamazoo	Diphtheria and typho-malarial fever	(See reply)	Bowel complaints	Dry weather in last of season.
Kalamazoo Asylum	Diphtheria, dysentery, pneumonia, consumption	Increased prevalence. The ratio of deaths to cases was not remarkably high.		
Manchester	Pneumonia, cholera morbus, cholera infantum, and membranous croup	Long continued extremes of temperature	None.	
Mendon	Congestive	Cannot give them	None.	
Tecumseh	More old people have died than usual	Cannot give them	None.	
Three Rivers	Pneumonia, diphtheria	Old people had severe attacks of pneumonia	Malarial	Drainage, and favorable meteorological changes.
Union City ... R. B.	Heart disease	Cannot give them	Scarlet fever	Cannot give them.
Union City ... E. H.	None		Typhoid fever and malarial diseases	Better drainage, better ventilation, better cellars, better care of person.
Vicksburgh	Lung affections.			
Ypsilanti	Typhoid fever.			
SOUTH-EASTERN DIV.*				
Detroit	Typhoid and typho-malarial fevers, diphtheria		Small-pox and measles.	
Dearborn	Malarial fever		Diseases of the bowels and lungs, and contagious diseases	Equable climate.
Northville	None.			
Pontiac	Cholera infantum and infirmities of old age	Long continued heat	None.	
Wyandotte	Diphtheritic croup		Scarlet fever.	

*For counties in each division see Exhibit 1, page 287.

13. To what do you attribute the lessened mortality?

Fourteen replies were received to this question, and they are abstracted in Exhibit 3, above.

14. Please give names and mention dates of the occurrence in 1881 of any and all diseases attended with an *unusually high rate of mortality*.

In reply to this question 8 correspondents reported that no disease was attended with an unusually high rate of mortality; typhoid fever was reported, but no time given, by 1; diphtheria by 1, and cholera morbus by 1. Ten correspondents made no reply, and 2 did not know. Of those replies which named some disease as at some time attended with an unusually high rate of mortality, there is a compilation in Table A on the following page:

TABLE A.—*Showing Number of Correspondents Reporting Certain Diseases as Attended with an Unusually High Rate of Mortality, by Months, in 1881, in Reply to Question 14, of Circular 50.*

DISEASES.	Months, 1881, and Number of Correspondents.											
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Bilious fevers	......	......	......	......	......	......	......	......	1	1	......	......
Bowel complaints	......	......	......	......	......	1	1	1	......	......	......	......
Bronchitis	1	1	1	1	1	1	1	1	1	1	1	1
Cerebro spinal men.	......	......	1	1	1	1	......	1	2	1	......	1
Cholera infantum	......	......	......	......	......	1	2	2	1	1	......	......
Cholera morbus	......	......	......	......	......	1	1	1	......	......	......	......
Congestion of brain	......	......	......	......	......	......	......	......	......	1	......	......
Diphtheria	2	3	2	3	2	1	1	2	3	4	5	4
Fever, intermittent	......	......	......	......	......	......	......	......	1	1	......	......
Fever, remittent	......	......	......	......	......	......	......	1	......	1	1	......
Fever, typhoid	......	......	......	......	......	......	1	1	2	7	5	2
Fever, typho-mal.	......	......	......	......	......	......	1	3	4	3	1	1
Measles	1	2	1	1	1	2	......	......	......	......	......	......
Pneumonia	1	2	3	2	1	1	......	......	......	......	1	1

15. **Please give names, and mention dates of the occurrence in 1881, of any and all diseases attended with an *unusually low rate of mortality*.**

In reply to this question, 8 correspondents said that no disease was attended with an unusually low rate of mortality. One correspondent reported measles, but gave no time; 2 reported scarlet fever at no time; 2 reported all diseases as being attended with an unusually low rate of mortality; all inflammatory complaints and contagious fevers, at no time, by 1; in May and June, few deaths from all causes, by 1; no death from scarlet fever, by 1. Twenty correspondents did not reply. The following is a summary of the replies of those correspondents who reported some disease at some time as being attended with an unusually low rate of mortality:

TABLE B.—*Showing Number of Correspondents Reporting Certain Diseases as Attended with an Unusually Low Rate of Mortality, by Months, in 1881, in Reply to Question 15, of Circular 50:*

DISEASES.	Months, 1881, and Number of Correspondents.											
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Cholera infantum	......	......	......	......	......	......	1	1	1	......	......	......
Diarrhœa	......	......	......	......	......	1	1	1	......	......	......	......
Diphtheria	......	......	1	1	1	1	1	1	......	......	......	......
Dysentery	......	......	......	......	......	......	1	2	2	......	......	......
Fever, typho-mal.	......	......	......	......	......	......	......	......	1	2	2	1
Measles	2	1	2	2	2	1	2	1	1	1	......	......
Respiratory passages	1	1	1	1	......	......	......	......	......	......	......	......

16. Please gives names, and mention dates of the occurrence in 1881, of any and all *diseases not usually occurring in your locality.*

In reply to this question, 4 correspondents stated that no disease was present not usually occurring in their locality; diseases were reported, but no time given, as follows:—Rötheln, by 1; varioloid, by 1; small-pox, by 1; scarlet-fever, by 1; diphtheria, by 2; typhoid fever, by 2; 1 reported typhoid forms of fever during summer months; cerebro-spinal meningitis, date not known, by 1; heart degeneration was reported by 1; 10 correspondents made no reply. The following table is a compilation of the replies by those correspondents who reported some unusual disease present at some time:

TABLE C.—*Showing, by Months, in 1881, the Diseases Reported as not Uusually Occurring in the Localities from which Replies were Received to Question 16, of Circular 50.*

DISEASES.	Months, 1881.											
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Cerebro-spl. congest'n	......	......	......	......	......	......	......	......	......	1	1	1
Cerebro-spinal men...	......	......	1	1	1	1	......	1	1	1	1	......
Cholera infantum.....	......	......	......	......	......	......	1	1	......	......	......	......
Cholera, winter.......	1	......	......	......	......	......	......	......	......	......	......	......
Cholerine............	......	......	......	......	1	1	......	......	......	......	......	......
Croup, membranous..	......	......	......	......	......	1	......	......	......	......	......	......
Diphtheria	1	3	1	2	3	2	2	3	4	4	4	2
Dysentery.............	......	......	......	......	......	......	......	......	1	1	......	......
Fever, intermittent...	......	......	......	......	......	......	......	......	1	1	......	......
Fever, scarlet..........	1	......	......	......	......	......	......	......	......	......	......	......
Fever, typhoid........	......	......	......	......	......	......	......	1	2	3	3	1
Fever, typho-mal.....	......	......	......	......	......	......	......	1	2	3	3	2
Jaundice...............	......	......	......	......	......	......	......	......	1	1	......	......
Measles................	1	......	......	1	1	1	2	1	......	......	......	......
Pharyngitis,exudative	......	......	......	......	......	......	1	1	1	1	1	1
Small-pox..............	......	......	......	......	......	......	......	......	......	......	......	1
Sunstroke	......	......	......	......	......	......	1	......	......	......	......	......
Whooping-cough......	1	1	1	1	1	1	......	......	......	......	......	......

17. State number of cases of each of the following diseases, and of any other epidemic, endemic, contagious, or infectious disease that appeared during 1881. (Facts are especially desired, but opinions are better than no statement, though it will be well to state them as opinions.) Small-pox, cholera, scarlet fever, typhoid fever, measles, whooping-cough, cerebro-spinal-meningitis, diphtheria.

18. Of the eight diseases mentioned in question 17, *name those of which no case appeared* during the year 1881.

All save one made replies in whole or in part to these questions. In many cases the numbers are estimates. The summary of the replies is as follows:

Small-pox.—39 correspondents stated that no case of small-pox had occurred in their locality; 4 correspondents reported a total of 29 cases, ranging from 1 to 25 cases, an average of 7 cases each.

Cholera.—42 correspondents said the disease was not present. One reported 4 cases, but it is not probable that they were cases of genuine Asiatic cholera.

Scarlet fever.—19 correspondents said no case of the disease was present; 20 reported a total of 366 cases, ranging from 1 to 120 cases each.

Typhoid fever.—11 correspondents stated that the disease was absent in 1881; 26 reported a total of 308 cases, ranging from 1 to 80 cases each. One reported a "few" cases and one reported "many."

Measles.—13 correspondents reported no case present; 20 reported a total of 1,411 cases, ranging from 4 to 400 cases, an average of 75 cases each. One reported "many," one said "hundreds," two that it was "epidemic," one said "numberless," one "a large number," one that they were "epidemic during summer."

Whooping-cough.—14 correspondents stated that no case was present; 18 reported a total of 859 cases, ranging from 2 to 150 cases, an average of 48 cases each; one reported "hundreds," one reported a "few," and two reported "many."

Cerebro-spinal meningitis.—29 reported no case present; 12 reported a total of 36 cases ranging from 1 to 7 cases, an average of 3 cases each.

Diphtheria.—10 correspondents reported no case present; 28 reported a total of 939 cases, ranging from 1 to 200, an average of 34 cases each. One reported "many."

One reported one case of dysentery, and one reported typho-malarial fever without giving the number of cases.

SPREAD OF COMMUNICABLE DISEASES BY SCHOOLS.

19. Has attendance on the public schools in your neighborhood in 1881 spread any of the diseases mentioned in question 17? If so, what diseases?

To this question 42 correspondents replied. 23 said "no"; one said that diphtheria was present in a school, for which the water-supply came from a "dead-end". By 18 correspondents the following diseases were thought to have been spread by attendance upon school: measles, by 9 correspondents; whooping-cough, by 4; scarlet fever, by 3; diphtheria, by 6; "possibly diphtheria," by 1.

20. Have you noticed any connection between the closing of schools and a decrease of communicable diseases in your vicinity? If so, what connection?

To this question 38 correspondents replied. 25 had not noticed any connection between the closing of schools and a decrease of communicable diseases. One said they controlled diphtheria by isolation of families having cases, without closing the schools. One said the schools were closed during an epidemic of diphtheria, but he could not say that it had any effect in abating the disease. One said the primary schools had been closed and reopened several times in six months. One said diphtheria gradually disappeared after the close of school. One believed that closing the schools for diphtheria was beneficial. One said diphtheria was very much lessened during summer vacation. One said contagious fevers, measles, and whooping-cough ceased during vacation. One said he had noticed such connection in measles. One said no whooping-cough subsequent to fall vacation. One said to stop whooping-cough they kept all infected families away. One said closing schools during an epidemic is a necessary and efficacious measure. One said the schools had not been closed. One could not say. Six did not reply to the question.

ORDER OF PREVALENCE OF DISEASES IN MICHIGAN IN 1881.

21. For each of the months in 1881 please give a summary statement of the diseases which occurred, naming the diseases in each month in the order of their prevalence,—the disease of greatest prevalence first.

The number of replies received to this question varied for different months, ranging from 26 to 33. A tabular summary of the replies is shown in Exhibit 4, on pages 296 and 297. The exhibit also contains statements compiled from the replies to this question from correspondents in 1877, 1878, 1879, and 1880. In this Report the exhibit is made to express by per cent what proportion of the total number of observers who replied to the question for the month under consideration reported the disease present in each month, instead of the number of observers only who reported the disease. The proportion of observers reporting any disease for several years or months may thus be readily studied, without taking into consideration the number of replies received for those years or months. It is thought that the replies were numerous enough to be in some degree representative. The number of correspondents who replied to the question for each month of each year may be found in each column of the exhibit for that month.

Additional statements are given respecting these diseases in the article on weekly reports of diseases, printed on subsequent pages of this Report. By comparing the per cent of observers reporting any disease present in any month, as shown in Exhibit 4, with the per cent of observers reporting the same disease present in the same month, as shown in the article on weekly reports of diseases, especially in the diagrams illustrating that article, it will be apparent that the proportion reporting the disease present is less in reply to this circular than by means of the weekly reports of diseases, and that this difference decreases toward the close of the year. The reason for this is believed to be that these replies are made after or just at the close of the year, and more prominence is naturally given to the diseases occurring in months recently passed; and those occurring in the earlier months of the year are not so prominently mentioned; whereas the article on weekly reports of diseases, being based on reports made at the close of each week, while the events of the week's practice are still fresh in the mind, is more reliable for close study. It is believed, however, that statistics of sickness collected at the close of the year are more to be relied upon than some other statistics collected in a similar manner,—the statistics of births and deaths, and most of the statistics for the U. S. census, for instance; because these statistics of sickness are collected by men of ample experience with the subject, and who mostly have books of record which are available for reliable reference.

DISEASES WHICH CAUSED MOST SICKNESS IN 1881.

In Exhibit 4, pages 296 and 297, are stated for diseases reported to be present during each month of the years 1877–1881, the proportion of observers reporting them present in each month; the diseases so arranged that the disease reported present in the year 1881, by the largest per cent of observers heads the list, the remaining diseases following in the order of their importance as causes of sickness in 1881. In regard to neuralgia and tonsilitis, it is proper to say that their apparent increase over 1877 may be due in part to the fact that the attention of observers was first specially called to these diseases in October, 1878, when they were first printed on the postal-card blanks used for making weekly reports of diseases.

EXHIBIT 4.—*Stating by months the Number of Correspondents who replied to the ques-to Circulars Relative to Diseases in Michigan in the Years 1877, 1878, 1879, 1880 and*

PROPORTION, PER CENT, OF CORRESPONDENTS WHO REPORTED

JANUARY.	1881.	1880.	1879.	1878.	1877.
Correspondents.*	26	23	15	29	17
Bronchitis	58	61	53	60	76
Pneumonia	51	43	47	48	59
Rheumatism	54	48	60	52	41
Influenza	42	43	40	45	47
Neuralgia	42	35	47	3	..
Intermitt't fever	35	35	60	52	18
Consumption	31	26	53	45	41
Tonsilitis	31	30	47	7	..
Remittent fever	31	13	27	31	41
Diphtheria	27	9	40	38	54
Erysipelas	23	9	13	3	18
Scarlet fever	15	9	33	28	18
Measles	11	22	7	7	6
Typhoid fever	11	13	13	3	6
Malarial fever	11	..	..		..
Croup	11	.	.	..	..
Diarrhea	8	4	13	14	12
Whooping-cough	8	13	13	10	18
Apoplexy	4	..	..	..	
Entero Colitis	4	..	..	..	..
Mumps	4	..	7	..	6
Pharyngitis	4	..	7	3	..
Quinsy	4	..	..	..	
Typh mal. fever	..	9	..	21	12
Cerebro-sp'l men.	..	4	..	..	..
Croup, Membr'n's	..	..	7	3	..

FEBRUARY.	1881.	1880.	1879.	1878.	1877.
Correspondents.*	26	24	15	28	18
Rheumatism	62	33	60	50	39
Bronchitis	58	54	73	79	67
Pneumonia	50	58	80	54	67
Neuralgia	46	21	47	7	..
Intermitt't fever	42	38	53	54	28
Influenza	38	50	53	50	50
Remittent fever	31	21	20	32	33
Consumption	27	25	47	46	28
Scarlet fever	23	8	20	32	17
Tonsilitis	23	29	40	7	..
Diphtheria	19	13	27	25	44
Measles	19	25	7	7	11
Diarrhea	15	4	13	14	11
Erysipelas	15	8	7	11	6
Malarial fevers	11	..	..		.
Croup	11	..		7	..
Typhoid fever	8	8	7	7	
Whooping cough	8	13	7	11	11
Cholera morbus	4	..	7	7	..
Croup, memb's	4	..	7	..	..
Enteritis	4	..	..	..	
Mumps	4	..		..	
Pharyngitis	4	..	7	4	11
Typho mal. fever	..	8	..	11	6
Dysentery	..	..	7	7	
Cerebro sp'l men.	..	..	.	4	11
Dyspepsia	..	.	..	11	..

MARCH.	1881.	1880.	1879.	1878.	1877.
Correspondents.*	27	24	15	30	17
Pneumonia	59	54	67	63	59
Bronchitis	56	50	73	63	71
Neuralgia	56	33	60	7	6
Rheumatism	56	42	80	53	47
Influenza	41	46	53	40	41
Intermitt't fever	41	38	60	63	47
Measles	37	25	7	3	18
Consumption	33	29	40	53	41
Diphtheria	33	4	33	27	35
Tonsilitis	30	25	47	7	..
Remittent fever	30	8	33	40	29
Erysipelas	22	4	13	3	12
Whooping-cough	11	25	7	7	18
Cerebro-sp'l men.	11	..	7	a7	6
Croup	11	.	7	7	..
Diarrhea	7	4	7	17	6
Malarial fever	7	.	..	..	..
Scarlet fever	7	4	20	33	29
Typhoid fever	7	8	7	7	6
Croup, memb's	4	..	7	..	..
Catarrhal fever	4	..	..	..	..
Laryngitis	4	..	..	..	..
Typho mal. fever	..	4	..	13	6
Mumps	..	.	13	7	12
Pharyngitis	..	..	..	7	6
Dyspepsia	..	.	..	7	..
Asthma	..	..	..	..	12

APRIL.	1881.	1880.	1879.	1878.	1877.
Correspondents.*	29	23	15	30	18
Intermitt't fever	69	57	73	67	61
Rheumatism	59	57	73	53	61
Remittent fever	52	13	33	33	17
Bronchitis	48	61	60	70	56
Measles	42	30		3	11
Neuralgia	42	26	53	7	..
Consumption	38	30	60	43	44
Pneumonia	38	48	27	47	44
Influenza	31	35	47	33	22
Tonsilitis	31	26	40	7	6
Diphtheria	24	13	40	b17	17
Diarrhea	17	9	13	17	17
Erysipelas	17	9	7	20	22
Scarlet fever	14	4	33	27	11
Cerebro sp'l men.	10		..		..
Rotheln	10		..		..
Whooping cough	10	13	7	7	..
Catarrhal dis'ses	10	..	7	..	6
Typhoid fever	7	.	13		11
Typho-mal. fever		4	7	11	25
Croup	3		c7	10	..
Small pox	3	..	..	..	
Laryngitis	3	..	.	.	..
Mumps	..	..	13	..	11
Dysentery	.	..	7	3	11
Pharyngitis	..	.	..	10	6

MAY.	1881.	1880.	1879.	1878.	1877.
Correspondents.*	29	22	14	27	17
Intermitt't fever	69	68	71	56	76
Rheumatism	52	27	50	41	59
Measles	45	23		4	18
Remittent fever	45	36	50	37	53
Bronchitis	42	36	50	56	47
Neuralgia	31	36	50		
Consumption	31	32	57	56	47
Diphtheria	28	14	36	43	53
Pneumonia	28	27	29	33	47
Diarrhea	17	18	14	30	18
Tonsilitis	17	18	36		
Whooping-cough	14	27	21	7	12
Cholera morbus	10				.
Influenza	10	27	29	30	29
Malarial diseases	10	14			
Scarlet fever	10	18	29	15	29
Catarrhal dis'ses	7	.	..	.	.
Cholera infantum	7	..		..	..
Rotheln	7	.	.		.
Typhoid fever	7	5	7	7	6
Erysipelas	3	14	14	19	15
Mumps	3	5	14	4	.
Cerebro sp'l men.	3	5	..	4	
Puerperal fever	3	.	..		12
Croup	3	..	.		..
Laryngitis	3	..	..	..	..

JUNE.	1881.	1880.	1879.	1878.	1877.
Correspondents.*	27	23	13	29	17
Intermitt't fever	81	74	85	83	88
Diarrhea	56	22	81	28	18
Remittent fever	48	39	69	31	71
Consumption	44	30	69	41	35
Rheumatism	44	35	54	45	41
Measles	37	22	23	3	18
Bronchitis	30	30	54	38	29
Neuralgia	30	39	38	3	..
Diphtheria	22	4	15	21	24
Cholera morbus	19	4	8	7	29
Tonsilitis	15	9	31	3	..
Cholera infantum	11	9		3	12
Pneumonia	11	9	23	28	35
Rotheln	11		..	..	..
Whooping cough	11	30	8	17	18
Catarrhal dis'ses	7	.	..	.	..
Dysentery	7	4	..	14	12
Erysipelas	7	9	8	10	12
Malarial dis'ses	7	9	..	..	..
Typho-mal. fever	7	9	..	17	12
Scarlet fever	7	9	23	21	24
Influenza	4	17	23	34	24
Typhoid fever	4	4	8	10	12
Cerebro-sp'l men.	4	..	..	..	..
Croup, memb's	4	..	..	..	..
Pharyngitis	4	..	..	..	..

a "Meningitis." *b* Includes one diphtheritic croup. *c* Membranous croup.

For comments on this Exhibit, see paragraph 21, on page 295, and the following paragraphs.

tion, and the Per Cent of Correspondents who Reported Cases of Certain Diseases in Reply 1881. (See Question 21 of Circular 50 on page 295, and the paragraphs which follow it.)

THE OCCURRENCE OF THE DISEASES NAMED.

JULY.	1881	1880	1879	1878	1877
Correspondents.*	30	25	13	29	19
Intermitt't fever	80	69	85	96	74
Diarrhea	73	69	89	62	63
Remittent fever	57	52	62	55	55
Cholera morbus	50	32	31	21	42
Cholera infantum	37	28	15	10	21
Consumption	33	23	54	45	32
Rheumatism	33	16	54	31	26
Neuralgia	27	24	38	..	..
Dysentery	23	32	23	14	21
Measles	23	12	8		11
Bronchitis	20	24	31	31	32
Diphtheria	17	8	38	17	21
Whooping cough	17	20	15	24	21
Tonsilitis	10	8	38	3	
Pneumonia	10	8	8	17	11
Typhoid fever	7	6	8	3	5
Typho-mal fever	7	8	..		16
Erysipelas	3	12	23	10	11
Scarlet fever	3	4	38	10	21
Malarial dis'ses	3	8	..	..	
Pharyngitis	3	.	.		.
Cerebro-sp'l men.	3	..		.	.
Croup, memb's	3	.	.	..	.
Influenza	..	4	31	28	5
Eczema	..	..	8	7	.
Sunstroke	..	.	8	7	.

AUGUST.	1881	1880	1879	1878	1877
Correspondents.*	30	25	14	30	19
Diarrhea	83	68	79	83	58
Intermitt't fever	80	69	93	90	79
Remittent fever	63	52	71	70	53
Cholera morbus	57	28	29	23	47
Dysentery	50	48	36	40	63
Cholera infantum	47	36	21	30	47
Rheumatism	30	12	36	30	21
Consumption	27	28	50	37	26
Diphtheria	23	4	43	20	16
Neuralgia	20	24	29	3	
Typho-mal. fever	20	24		10	16
Measles	17	4	14	7	.
Bronchitis	13	12	29	40	26
Enteritis	10	.		..	
Scarlet fever	10	4	29	7	21
Typhoid fever	10	16	7	17	11
Whooping-cough	10	20	21	23	21
Malarial dis'ses	7	8			
Erysipelas	3	8	14	10	11
Influenza	3	4	29	13	.
Pneumonia	3	4	21	17	5
Tonsilitis	3	..	29	10	.
Cerebro sp'l men.	3	.		.	.
Continued fevers	3	.	..	..	..
Croup, memb's	3	..	.	.	..
Pharyngitis	3	..	.	..	..

SEPTEMBER.	1881	1880	1879	1878	1877
Correspondents.*	30	25	15	28	19
Diarrhea	83	64	80	79	[illegible]
Intermitt't fever	80	64	80	86	84
Remittent fever	63	52	67	71	53
Cholera morbus	53	20	13	14	26
Dysentery	47	28	40	61	63
Diphtheria	43	12	40	25	16
Typho-mal. fever	40	20	13	36	26
Consumption	33	36	40	43	26
Cholera infantum	30	12	13	14	32
Rheumatism	27	20	33	36	32
Bronchitis	23	8	40	32	16
Neuralgia	20	24	33	4	
Typhoid fever	20	16	27	11	21
Whooping-cough	13	20	7	25	5
Cerebro sp'l men.	10			.	.
Tonsilitis	10	8	33	4	..
Enteritis	7	.		..	..
Erysipelas	7	..	13	21	11
Malarial dis'ses	7	4	..	..	8
Catarrh	3	..	..	..	..
Continued fevers	3	..		..	..
Peritonitis	3			.	..
Pneumonia	..	12	13	14	5
Influenza	.	8	27	32	11
Measles	..	4	13	4	..
Scarlet fever		4	7	11	21

OCTOBER.	1881	1880	1879	1878	1877
Correspondents.*	33	25	14	29	19
Intermitt't fever	72	64	93	83	79
Diarrhea	56	40	71	41	47
Remittent fever	53	44	71	69	69
Typho-mal. fever	53	28	7	34	32
Consumption	41	32	50	48	42
Rheumatism	38	28	50	34	26
Diphtheria	31	20	57	41	32
Typhoid fever	31	16	29	21	16
Bronchitis	28	28	50	52	26
Neuralgia	25	24	36	11	5
Dysentery	16	4	29	34	32
Tonsilitis	16	28	43	14	
Cholera morbus	13	16	14	7	5
Whooping cough	13	16	7	31	16
Cerebro sp'l men	6	.	..		
Enteritis	6				
Erysipelas	6	12	14	17	5
Pharyngitis	6		..	.	11
Influenza	3	24	21	41	32
Malarial dis'ses	3	8		.	
Pneumonia	3	8	14	7	11
Catarrh	3	..			
Continued fevers	3				
Scarlet fever	..	8	21	17	26
Measles	..	4	14	3	.
Cholera infantum	..	.	..	3	16

NOVEMBER.	1881	1880	1879	1878	1877
Correspondents.*	33	23	14	29	19
Intermitt't fever	76	61	86	72	74
Rheumatism	55	43	57	41	58
Typho-mal. fever	45	4	14	28	37
Consumption	42	35	50	55	37
Remittent fever	42	26	43	48	63
Bronchitis	39	43	50	66	47
Neuralgia	36	35	50	24	5
Diphtheria	33	35	50	52	47
Tonsilitis	33	26	50	17	
Diarrhea	27	13	21	28	37
Pneumonia	21	17	36	38	16
Typhoid fever	21	13	21	14	21
Erysipelas	18	22	21	14	5
Influenza	16	39	29	35	21
Whooping cough	12	13	7	41	21
Scarlet fever	9	22	14	21	26
Pharyngitis	6	.	7	7	5
Dysentery	3	4	7	10	16
Malarial dis'ses	3	9	.		
Catarrh	3	..		.	.
Cholera infantum	3	.		.	
Cholera morbus	3	..	.	.	
Enteritis	3	..	..		
Laryngitis	3	..	.	.	..
Measles	.	9	21	7	.
Cerebro-sp'l men.	..	..	..	3	

DECEMBER.	1881	1880	1879	1878	1877
Correspondents.*	31	24	15	29	17
Intermitt't fever	65	46	73	48	52
Rheumatism	58	54	60	55	47
Bronchitis	52	58	53	76	33
Pneumonia	52	38	40	55	41
Tonsilitis	48	29	27	25	
Consumption	42	33	40	45	35
Neuralgia	39	33	47	21	..
Diphtheria	35	33	60	59	53
Remittent fever	35	17	53	24	59
Typho-mal. fever	29	4		14	29
Influenza	19	50	40	62	24
Scarlet fever	19	13	20	21	29
Typhoid fever	19	17	7	7	12
Diarrhea	13		27	7	6
Erysipelas	10	21	7	17	..
Whooping-cough	10	8	13	38	24
Jaundice	6	.	.	.	..
Pharyngitis	6	.	7	7	6
Croup	3	8		10	..
Measles	3	13	33	7	..
Catarrh	3	..	.	..	..
Cerebro sp'l men.	3	..	.	.	..
Mumps	3	..	.	.	..
Varioloid	3	.	.		..
Croup, memb's	..	..	7	10	..
Dysentery	..	..	7	7	12

* The numbers in this line state for the month, in each year, how many correspondents replied to the question for that month.

Intermittent fever leads other diseases in area of prevalence in April, May, June, July, October, November, and December; it is second in August and September; it is fifth in February, and is the sixth in order of area of prevalence in January and March. Bronchitis heads the list in January, it is second in February and March, and is third in December. Pneumonia heads the list in March; it is second in January, third in February, and fourth in December. Rheumatism heads the list in February; it is second in April, May, November, and December; it is third in January and fourth in March. Diarrhea heads the list for August and September; it is second in June, July, and October. It will be instructive to compare the diseases shown in Exhibit 4 with the article on the Principal Meteorological Conditions in Michigan in 1881, as printed on subsequent pages of this Report.

DISEASES AMONG ANIMALS, IN 1881.

22. During the year 1881, *what diseases* occurred, *at what time*, and *to what extent among animals?* The term epizooty has been much used in this State relative to diseases among animals; as it does not designate a definite or distinct disease, please describe the character of any disease which may have occurred. Replies concerning the prevalence, character, and communicability of "hog cholera" are especially desired.

Thirty-nine correspondents replied to this question, 16 of whom replied that no disease among animals occurred in 1881; one of those replying no, said that animals were remarkably free from diseases. Two did not know. One said there was no hog cholera or epizoöty. Among horses, the following diseases were reported:—Pink-eye by 4, one saying the disease was a "catarrhal affection of the eyes, which run profusely; stiffness of joints; lasts four or five days." Two correspondents said the disease prevailed in December. Horse-distemper was reported in Spring by 1, and at time not given by 1. Influenza was reported in January and February by 1, and epidemic influenza by 1. One reported a disease affecting the mucous membrane of the nose, throat, and lungs, in November and December; 1 reported a few cases of broncho-nasal catarrh in November; 1 reported a few cases of epizoöty; 1 reported a few cases of pneumonia; 1 reported a number of deaths from cerebro-spinal trouble in February and March; 1 reported a case of doubtful glanders. The following diseases were reported as affecting hogs:—Hog-cholera was reported by 8 correspondents; in July, August, and September by 1; in August and September by 1; not as prevalent as formerly by 1; 1 said no two hogs were attacked alike—some forward, some in the hinder parts, and some in the spinal region; 1 said the disease was scattered. One correspondent said the disease was quite prevalent and fatal in some instances where the hogs had access to stagnant water. One correspondent asks: "Might not the increased malignancy of diseases in 1881 be attributable to the diseased pork raised the year before? as 'hog-cholera' was very prevalent during the fall of 1880, continuing nearly all the winter of 1880–81, most of them dying off." An epidemic among the hogs at the Asylum for the Insane at Kalamazoo, from September 15 to November 15, was reported; 27 hogs died; the attacks commenced with diarrhea and vomiting, and the lungs of two animals which were examined were found diseased. The epidemic was quite fatal. Chicken-cholera was reported by 2 correspondents, 1 saying the disease was scattered. Splenic fever was reported by one correspondent as existing among sheep in January, February, March, and April.

23. Within your observation was the "hog-cholera" or a similar disease prevalent among other animals, as mice, rats, cats, dogs, hens, colts, etc., and man?

Thirty-three replies were received to this question, 31 saying they had not observed "hog-cholera" or a similar disease present in any other animal than the hog; 1 said he did not know; and 1 had never observed. For statements relative to this disease in hogs, and for suggestion as to its relation to diseases in man, see summary of replies to question 22, preceding.

24. If you know of any injurious effect caused by eating the flesh, lard, or other product of hogs diseased with "*hog-cholera*," please state the facts.

Thirty correspondents replied to this question, 26 saying they did not know of any such effect, and one said he did not know. One correspondent (J. E. Scallon, M. D., of Hancock) reported sickness after eating liver sausage which contained pork. The full report is printed in the replies immediately following the summary. One said he had not noticed any such effect, although he had seen used for food hogs so sick with the hog-cholera that they could not stand alone.

25. If you know of any case of communication of hog-cholera to man, by inoculation or otherwise, please state the facts.

Twenty-seven replies were received to this question, 25 saying they knew of no such case, 1 saying he did not know, and 1 had no data.

DISEASES IN FRUITS, CEREALS, GRASSES, POTATOES, AND OTHER CROPS.

26. During the year 1881, what diseases, as rot, rust, smut, bunt, mildew, or mold, occurred among the crops, as potatoes, hops, fruits, and especially cereals and grasses?

Thirty-three replies were received to this question; 18 said no diseases occurred; 2 said no cereals were raised; 2 did not know; 2 said very few; 1 said none except the usual amount; 1 could not say; 1 of the observers who reported no disease present said there was an excellent crop of potatoes; 4 reported smut in corn, 1 reporting the usual amount and 1 an unusual amount; 1 reported mold in corn fodder; 4 reported rot in potatoes, 1 saying they rotted early in the Fall and 1 saying it was unusually prevalent; 2 reported rot in apples, 1 saying they dropped prematurely; 1 reported slight rust in wheat and oats.

27. As regards rye, oats, corn, buckwheat, and other grains raised in 1881, wheat in particular, what was the actual condition when ready for market or use?

Thirty-nine replies were received to this question; 23 said the condition was good or fair; 4 said all were good, but short crops; 3 said none were raised in their localities; 1 said wheat good, buckwheat damaged; 1 said wheat was good but corn was grown; 1 reported wheat in poor condition; 1, wheat damp; 1 said corn and buckwheat damp and mildewed, others good; 1 said buckwheat shelled out and kept blossoming; 1 said not quite as good as usual, 1 wet, and 1 very dry.

28. Were any of these grains mentioned in question 27 affected by any kind of fungus?

Thirty-two replies were received to the question, 26 replying no; 1 of those who said no said the army worm had nearly destroyed many pieces of oats; 1 did not know, and 1 could not say; 1 said more smut than usual in corn, and 1 said corn was badly affected with smut, and 1 reported smut in oats; 1 said none was raised in his locality.

29. Was the wheat raised in 1881 generally allowed to get thoroughly dry before it was threshed?

Thirty-seven correspondents replied to this question; 31 said yes; 3, no; 1, much of it damp; 1, not as much as usual; and 1 saying none raised there.

30 Did a *greater*, a *less*, or the *usual proportion* of wheat raised in 1881 "bank" in the bin?

Thirty-two replies were received to this question, 7 saying none banked in the bin, 14 saying less, 3 the usual amount, and 2 more; 1 said they raised none; 1 did not know; 3 said no, and 1 yes; these replies not answering the question, because they are improper words to use in such a connection.

31. Was the hay crop secured in 1881 *more* or *less than usually* affected by mildew or mold?

Thirty-six replies were received to the question, 4 saying it was not affected, 12 saying less, 2 as usual, 1 "not badly," and 6 saying more; 2 said the hay crop was good; 9 said no, which does not answer the question.

32. Please give a summary statement of the meteorological conditions during the year 1881, specifying, if possible, the general character for each month, and noting any peculiar or unusual conditions.

In reply to this question, 18 correspondents gave more or less complete synopses of the meteorological conditions as they existed during the year. They are printed in full in the replies of the correspondents, on pages following. For a more complete detailed statement of the principal meteorological conditions in the year 1881, in different parts of the State, the reader is referred to the article on that subject in subsequent pages of this volume. A summary of the conditions, compared with preceding years, may be found by referring to the index, in the Exhibit —, "Comparisons of Meteorological Conditions," in the article just mentioned.

SOIL MOISTURE IN 1881.

33. Please state the facts concerning the *soil moisture* in your locality during each of the months in the year 1881, *without reference to previous years*, but comparing the months in 1881 with each other. Group them in order—driest first.

34. *Compared with previous years*, in what months of the year 1881 was the *soil* in your locality *unusually dry?*

35. *Compared with previous years*, in what months of the year 1881 was the *soil* in your locality *unusually moist?*

Thirty-one correspondents replied to at least one of the above three questions. An abstract of the replies and a summary to these questions is given in Exhibit 5, on page 301.

36. Please state the average depth of water in wells in your locality in each month of the year 1881.

37. In your locality what is the *usual average depth of earth above the ground water*, as indicated by distance from the general surface of the ground down to water in wells, streams, etc.? If different parts of your locality vary greatly, please answer for such different parts.

38. Without reference to previous years, please state the facts concerning the *depth of earth above the ground water* nearest the surface in your locality during each month of the year 1881, as indicated by the distance down to water in wells, streams, etc., or by other facts. How many feet and inches do you estimate it in each month?

39. Compared with previous years, in what months of the year 1881 was the *ground water* in your locality *unusually high?*

40. Compared with previous years, in what months of the year 1881 was the *ground water* in your locality *unusually low?*

Thirty-six correspondents replied to at least one of the above five questions. An abstract of their replies and a summary to the questions is given in Exhibit 6, on pages 302 and 303.

EXHIBIT 5.—*Soil Moisture in Michigan by Months during the year 1881, as Indicated by the Replies of 31 Correspondents to questions 33, 34, and 35, of Circular 50, from the State Board of Health.*

Divisions* and Localities.	Soil Moisture by Months and without Reference to Previous Years. Months in Order of Dryness. Driest First.—(Question 33, page 300.)	Soil Unusually Dry, Time.—(Question 34, page 300.)	Soil Unusually Moist. Time.—(Question 35, page 300.)
All Localities.	†	‡	§
UPPER PENINSULAR DIV.*			
Delaware Mine	July, Aug., and Sept., 15 per cent, and in Oct. and Nov. 100 per cent greater than usual.	None	July, Aug., Oct., and Nov.
Hancock	The soil was very dry from May to Sept.		
Nonesuch	The whole year was unusually wet and rainy, after October no dry weather.	No month of 1881 unusually dry; all unusually wet.	All the year.
WESTERN DIVISION.*			
Muskegon	May, June, July, Oct, Sept., Aug., Nov., Apr., Mar., Jan., Feb., Dec.	July	March and Oct.
BAY AND EASTERN DIV.*			
Brockway Center		July, Aug., Sept.	Not any.
St. Clair		June, Aug., drier than any year since 1867.	Oct.
Thornville	July, Aug., May, Apr., June, Dec., Feb., Jan., Mar., Sept., Oct., Nov.	In each month	In no month.
CENTRAL DIVISION.*			
DeWitt		Apr., Aug, Dec.	Oct. and Nov.
Hastings		July and Aug.	Apr. and May.
Linden	July, Sept., Aug., May	June, July, Aug.	Feb., Oct., Nov.
Otisville	Sept., Aug., July, June, May, Oct., Nov., Apr., Dec., Jan., Feb., Mar.	Aug. and Sept.	In no month.
St. Johns	Aug., July, June, Sept., Dec., Oct., Nov.	Aug. and July.	
Stanton	July, Aug., May, Sept., Oct., Apr., June, Nov., Dec., Feb., Mar., Jan.	May, July, Aug.	Sept., Oct., Nov.
Webberville	July, Aug., June, Sept., May, Oct., Jan., Feb., Nov., Mar., Apr., Dec.	July and Aug.	Nov. and Dec.
Wood's Corners	Aug., Sept., July	Surface soil, Aug., July, and Sept.	April, May, and June.
SOUTH WESTERN DIV.*			
Allegan			July.
Niles[a]	June, July, Aug.	June and July.	Nov. and Dec.
Niles[b]	July, Aug., Sept., June, May, Apr., Oct., Mar., Feb., Jan., Dec., Nov.	July, Aug., June, May, April.	In no month.
Pokagon		July, Aug., Sept. up to 10th.	From Sept. 10 to close of year.
St. Joseph	Aug., Jan., Mar., Apr., May, June, July, Sept., Oct., Nov., Dec.	Aug. and Jan.	Sept., Oct., Nov., Dec.
SOUTHERN CENTRAL DIV.*			
Jerome		All the fall until quite late.	
Kalamazoo		Aug. and Sept.	June, July, Nov.
Manchester	Sept., May, July, Aug., Apr., Nov., Dec.	May and Sept.	Nov. and Dec.
Mendon	Aug., July, May, Sept., Jan., June, Feb., Mar., Apr., Oct., Nov., Dec.	Aug., July, Jan.	Oct., Nov., Dec., Feb.
Tecumseh	May, Apr., June, Mar., Feb., Jan., July, Aug., Nov., Dec., Oct., Sept.	Apr. and May.	Sept. and Oct.
Union City[c]	Aug., July, Sept., June, Oct., Apr., May, Jan., Feb., Mar., Nov., Dec.	Aug., July, Sept.	Nov. and Dec.
Union City[d]	May, June, July, Aug., Sept., Oct., Nov.	May, June, July, Aug., first part of Sept.	Fall and winter months.
Vicksburgh			Latter part of Sept. and Oct.
Ypsilanti	Nov., Oct., July	Nov.	April.
SOUTH EASTERN DIV.*			
Dearborn	Aug., Sept., July, Oct., Jan., Feb., Mar., Dec., Apr., Nov., May, June.	July, Aug., Sept., Feb.	May and June.
Pontiac	Aug., July, Sept.	Aug., July, Sept.	Nov., Mar., April.

* For counties in each division, see Exhibit 1, page 287.

† These statements cannot well be summarized. Most of them name the months in order of dryness of soil, driest first. Twenty-two correspondents made statements in reply to question 33.

‡ Soil reported *unusually dry* at some time of the year 1881, by 28 correspondents, as follows:—In Jan. by 3; Feb., 2; Mar., 1; Apr., 4; May, 6; June, 6; July, 17; Aug., 19; Sept., 11; Oct., 1; Nov., 2; Dec., 2; In no month, by 2; all the fall until quite late, by 1.

§ Soil reported *unusually moist* at some time of the year 1881, by 28 correspondents, as follows:—In Jan. by 1; Feb., 3; Mar., 3; Apr., 5; May, 4; June, 4; July, 4; Aug., 2; Sept., 6; Oct., 12; Nov., 14; Dec., 8. In no month by 4. In fall and winter months, by 1.

[a] Simeon Belknap, M. D. [b] Irwin Simpson, M. D. [c] R. P. Beebe, M. D. [d] E. H. Hurd, M. D.

EXHIBIT 6.—*Depth of Water in Wells, Depth of Earth above Ground Water, and Relative Height of Ground Water, in Michigan, by Months, during the Year 1881,—as Indicated by the Replies of 36 Correspondents to Questions 36, 37, 38, 39, and 40, of Circular 50, from the State Board of Health.*

Divisions* and Localities.	Average Depth of Water in Wells, by Months.—(Question 36, page 300).	Usual Depth of Earth Above Ground Water,—(Question 37, page 300).	Depth of Earth Above Ground Water, by Months,—(Question 38, page 300).	Ground Water Unusually High. Time.—(Question 39, page 300).	Ground Water Unusually Low. Time.—(Question 40, page 300).
All Localities.	†	‡	§	‖	¶
UPPER PENINSULAR DIV.*					
Delaware Mine	Springs generally used, and always good.	Surface broken, drainage good; can tap ledges at short distance and secure spring water.			
Hancock	No wells. Cannot strike water even at 50 ft. All sand.	1 ft. to 90 ft.		At no time	Everything dried up.
Nonesuch	Only one well. Depth of water in May, 1882, 23 ft.	Only one well, which is 80 ft. deep.			
WESTERN DIVISION.*					
Muskegon				March	July.
BAY AND EASTERN DIV.*					
Brockway Center	Jan., Feb., May, Dec., 15 ft.; March, April, 18 ft; June, Nov., 10 ft.; July, 8; Aug., 6; Sept., 3; Oct., 7.	From 3 to 20 ft.		At no time	Aug., Sept.
St. Clair	In Aug. many wells went dry.	8 ft. to 10 ft. on flats			Aug., Sept.
Thornville		From 15 to 100 ft.	Jan., 17 ft. 11 in.; Feb., 17 ft. 4 in.; Mar., 17 ft.; Apr. and May, 16 ft. 6 in.; June, 16 ft. 5 in.; July, 17 ft. 5 in.; Aug., 17 ft. 6 in.; Sept. and Oct., 17 ft. 8 in.; Nov., 17 ft. 6 in.; Dec., 17 ft. 9 in.	At no time	In each month.
CENTRAL DIVISION.*					
De Witt		Varies from 10 ft. to 80 ft.	Varies from 10 ft. to 80 ft.	Oct., Nov.	Aug., Sept.
Hastings		From 20 ft. to 70 ft.			
Linden	Jan., Feb., Mar., Apr., June, Nov., Dec., 6 ft.; May, 7 ft.; July, 5 ft.; Sept., 4 ft.; Oct. and Aug., 4½ ft.	20 ft. to 25 ft.	Jan., Feb., March., April, June, Nov., Dec., 24 ft.; May, 23 ft.; July 25 ft.; Aug. and Oct., 25½ ft.; Sept., 26 ft.		
Otisville		4 ft. to 12 ft.	From middle of Aug. to middle of Sept. nearly all wells and small streams were dry.	At no time	Aug., Sept.
St. Johns	Wells constantly fill with quicksand and frequently have to be deepened.		Level varies but little		Aug., Sept.
Stanton		25 ft.		Sept., Oct., Nov.	July, Aug.
Webberville		10 ft. to 30 ft.		Mar., Apr., Nov., Dec.	July, Aug., Sept.
Wood's Corners	Much deeper than for several years.	From 15 ft. to 80 ft.; average about 25 ft.		All the year	At no time.

SOUTH-EASTERN DIV.*					
Allegan		30 ft. to 60 ft.			
Bangor		10 ft. to 40 ft.; usually 30 ft.			
Dayton		Av. 32 ft.; from 8 ft. to 50 ft.			
Niles [a]		3 ft. to 40 ft.		Nov.	July.
Niles [b]				At no time	All the year.
Otsego			In village about 18 ft.		
Pokagon		15 ft. to 20 ft. in valleys; 30 ft. to 40 ft. on uplands.			July, Aug., and first part of Sept.
St. Joseph	Jan., Feb., Aug., 12 ft.; Mar., May, Sept., 10 ft.; Apr., Oct., 9 ft.; June, July, 11 ft.; Nov., 8 ft.; Dec., 7 ft.	2 ft to 15 ft.		Dec, Nov., Oct., July	Aug., Jan.
SOUTHERN CENT. DIV.*					
Hillsdale	Wells 35 to 70 feet; little affected by rains.	On flats of St. Joseph river, 12 ft. to 15 ft.; away from flats, 30 ft. to 60 ft.		Oct., Nov., very rainy	Aug., Sept.
Jerome		6 ft. or 7 ft.			
Kalamazoo		On table lands, 80 ft. to 100 ft.; valley plains, 20 ft.; bottoms, 6 ft. to 12 ft.		June, Nov.	Aug., Sept.
Manchester		Surface irregular		Dec., Jan., Apr.	May, Sept., Aug., July.
Mendon		15 ft. to 18 ft.		Oct., Nov., Dec., Feb.	July, Aug, and first part of Sept.
Tecumseh	3 ft. all the year. Water in gravel.	25 ft. to 40 ft.; no great variation.	Same all the year	At no time	At no time.
Union City [c]		12 ft to 40 ft.		Nov., Dec.	Aug., July, Sept.
Union City [d]		About 35 ft.			
Vicksburg	Most are driven wells. Quite uniform during yr.	12 ft. to 18 ft.		Oct., latter half of Sep.	August.
Ypsilanti		About 25 ft.; varies according to distance from Huron river.		Dry weather did not affect wells.	
SOUTH-EASTERN DIV.*					
Dearborn	Jan., Apr., Dec, 8 ft.; Feb., Mar., 7 ft.; May, 10 ft.; June, 12 ft.; July, 9 ft.; Aug., 6 ft.; Sept., Oct., 4 ft.; Nov., 5 ft.	In sandy ground, from 6 ft. to 12 ft.; clay ground, from 10 ft. to 80 ft.	Jan., Apr., 8 ft.: Feb., 9 ft.; Mar., Dec., 12 ft.; May, 3 ft.; July, 7 ft.; Aug., 14 ft.; Sept., 20 ft.; Oct., 19 ft.; Nov., 14 ft.	May, June	Aug., Sept., Oct., Nov., Jan.
Northville	Not much variation; from 2 ft to 3 ft.	30 ft. to 50 ft.	Water in a stratum of gravel, 30 to 40 ft. deep.		Oct.
Pontiac	Jan., Feb., Mar., Apr., 3 ft. to 15 ft.; May, June, Nov., 2 ft. to 12 ft; July, 2 ft. to 8 ft.; Aug., 0 to 6 ft.; Sept., Oct., 0 to 4 ft.; Dec., 3 ft. to 15 ft.	8 ft. to 90 ft.; varies greatly		Jan., Feb., Mar., Apr.	Aug, Sept., Oct.

* For counties in each division see Exhibit 1, page 287. † In reply to question 36, 15 of the 36 correspondents who replied to this series of questions made statements (not all of them, however, by months) concerning the average depth of water in wells in 1881. An abstract from the statements is given in the second column of the Exhibit. They cannot well be summarized. ‡ In answer to this question (37), 32 correspondents made statements concerning the usual average depth of earth above ground water in 1881. § In reply to this question (38), 9 correspondents made statements concerning the depth of earth above ground water, by months, in 1881. ‖ Ground water reported *unusually high* at some time of the year 1881 by 22 correspondents, as follows:—In Jan., by 2; in Feb., by 2; Mar., 3; Apr., 3; May, 1; June, 2; July, 1; Sept., 2; Oct., 6; Nov., 9; Dec., 5; at no time, by 5; all the year, by 1. ¶ Ground water reported *unusually low* at some time of the year 1881 by 25 correspondents, as follows:—In Jan., by 2; May, by 1; July 8; Aug., 17; Sept., 14; Oct., 3; Nov., 1; all the year, by 2; at no time, by 2. [a] Simeon Belknap, M. D. [b] Irwin Simpson, M. D. [c] R. P. Beebe, M. D. [d] E. H. Hurd, M. D.

41. Please communicate facts bearing upon, or cases illustrating the causation or communicability of diseases.

Nine correspondents replied to this question. One said the surface drainage was very defective and sewage was left standing in poorly constructed receptacles. One said the hot weather in August caused much sickness among infants. One called attention to the fact that rheumatism and erysipelas had been about the same at all times of the year. One reported that diseases had an unusual tendency to malignancy. One reported that a son came home from a distance sick with typhoid fever, and communicated the disease to 8 or 9 members of the family, resulting in 2 deaths. One said typhoid fever occurred in a patient who had been away from home. One said typhoid fever and diphtheria in a severe form had co-existed in different members of the same family. One said small-pox was imported from San Francisco by a criminal.

42. If scarlet fever occurred in your locality in the year 1881, please state the facts concerning the means by which it was introduced and communicated.

Twenty-five replies were received to this question, seven saying the disease was not present in 1881. Two said the facts were not known, and one could not determine. The disease was reported by 5 correspondents as being imported into their locality. One said scarlet fever was present, but not in the same house or family as in 1880, and that it did not spread beyond the first family attacked. One reported one case as produced from germs remaining latent from the year before. One reported the first case as produced by moving the furniture in a log house in which a child had died from scarlet fever three years before, and reported other cases from contagion. One said the disease was supposed to be communicated by clothing. One said scarlet fever had probably existed in his vicinity for three or four years. One said "filth," and one "contagion." One reported mild, sporadic cases only; and one thought the cases were all sporadic, but may have come from cases the year previous. One said the cases seemed to arise independent of contagion.

43. If diphtheria occurred in your locality in the year 1881, please state the facts concerning the means by which it was introduced and communicated.

Thirty-two replies to this question were received, 6 saying the disease was not present in their locality in 1881; 7 correspondents reported the disease as imported into their locality, 1 saying the first case died and a public funeral was held before the nature of the disease was known; 1 said it was introduced by a nurse from the Asylum for the Insane, at Kalamazoo, where the disease prevailed; 1 said the disease was imported from Detroit, was thoroughly quarantined and did not spread; 3 said the facts were not known; 1 said no known cause for first cases; 1 said the mode of introduction was not known, but it was spread by schools; to 1, the manner of introduction was unknown; 1 said "filth;" 1 said filth was the cause in one instance and the cellar in another; 1 thought it was caused by filth, only one family being attacked; 1 could not trace diphtheria to a contagious cause; 1 said the cases were mostly sporadic, few were due to contagion; 1 reported three sporadic cases; 1 reported "sporadic cases only;" 1 reported isolated cases, cause not traceable; 1 said the disease has existed in neighboring towns for some time; 1 said diphtheria had got to be a general disease, occurring probably from latent germs, in each month of the year, all over the city; 1 said in one family diphtheria seemed to have been caused by foul water, in another the cause could be traced to contagion; 1 said diphtheria was spread by contagion, and 1 said by personal contact or communication. One of those who reported the disease absent said he had not seen a case there (Delaware Mine) in twelve years.

44. Suggestions concerning methods which seem practicable for the prevention of sickness or deaths in your locality, or in this State, will be gladly received.

Seven correspondents replied to this question. One said "shoot the village and township boards and elect men who know the value of sewerage;" 1 would have the practice of medicine restricted to qualified persons; 1 suggested a better and more thorough system of drainage; 1 said the removal of two mill-dams in his locality would prevent back-water from forming marshes; 1 said shut up the saloons; 1 suggested more care in removing noxious materials from around dwellings, better care of cellars, better ventilation, and better drainage; 1 said the conditions in his village were very healthful, and not much improvement could be made, only 12 deaths in 1,000 population in 1881.

As stated after question 17, in the absence of positive knowledge, opinions are desired. The fact that it will be difficult, and sometimes impossible, to give the information asked for is well understood; the importance of the subject, however, warrants the request that each correspondent will take the care necessary to give definite replies to all the questions. The great value of a compilation of such replies must be conceded. Inasmuch as a similar circular will probably be issued for 1882, it would facilitate replying to that circular and add to the value of the replies, if correspondents would, during the year, make a record of facts concerning the prevalence of diseases, concerning meteorological conditions, and concerning soil moisture and ground water observed during the year. It is believed that in this way may be accumulated data which eventually will be of great value to the people.

By direction of the State Board of Health. Very respectfully,

HENRY B. BAKER, *Secretary.*

For convenience of study and reference, the replies to the circular have been grouped by geographical divisions of the State, which divisions are shown in Exhibit 1, page 287. It should be remembered that the Board assumes no responsibility for opinions or theories expressed by those who reply to its circulars, but its correspondents have been selected with great care, and include many of the leading physicians in the State.

Respectfully submitted,

HENRY B. BAKER,
Secretary.

The replies to Circular 50 are as follows:—

UPPER-PENINSULAR DIVISION OF THE STATE.*

REPLIES BY THOS. D. BRADFIELD, M. D., OF DELAWARE MINE, MICH.

3.† Grant township, Keweenaw Co., or, to be literal, Delaware mine location.
4. One-third greater.
5. Same.
6. Typhoid fever, cholera infantum.
7. Greater rainfall, followed by very warm days,—cholera morbus.
8. Scarlet fever.
9. Scarlet fever and measles died out early in the year and did not reappear.
10. Cholera infantum.
11. Cold rains, followed by very warm weather.
12. Scarlet fever.
13. Disease not existing.
16. Cholera infantum in July and first half of August.
17. Scarlet fever, 10; typhoid fever, 4; measles, 43.
18. Small-pox, cholera, whooping-cough, cerebro-spinal meningitis, diphtheria.
19. No.
20. No. Diseases controlled without closing schools, by isolating families in which the disease existed.
21. *January and February:* Measles, scarlet fever, pneumonia, bronchitis, rheumatism, erysipelas.
March and April: Measles, pneumonia, rheumatism and bronchitis.
May and June: Cases scattered, but none contagious.
July and August: Cholera infantum, dysentery, diarrhea, bronchitis.
September and October: Typhoid fever, dysentery, diarrhea.
November: Pneumonia, erysipelas, rheumatism, dysentery.
December: Measles, pneumonia.
22. None.
23. No.

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* For counties included in each division, see Exhibit 1, page 287.
† The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 282-305 of this Report. A summary of the Replies is printed on pages 283-305.

24,† 25, and 26. None.
27. None raised in this township.
33. July, August, September, 15 per cent, and in October, and November, 100 per cent greater than usual.
34. In none.
35. July, August, October and November.
36. Springs generally used, and always good.
37. Surface broken and drainage good. Can tap ledges at short distance and secure spring-water.
42. Scarlet fever continued from 1880, and was communicated by families visiting in those where the disease existed.
43. Never saw a case of diphtheria here in a 12 years residence.

THOS. D. BRADFIELD, M. D.
Delaware Mine, Keweenaw Co., Jan. 16, 1882.

REPLIES BY J. E. SCALLON, M. D., OF HANCOCK, MICH.

1.† Three thousand five hundred.
2. Forty-two.
3. The village and township of Hancock. (The township includes the village.)
4 and 5. About the same.
6. Scarlet fever, measles, bronchitis, typhoid fever, diphtheria, whooping cough.
7. None assigned.
8. Diarrhea.
9. Finer weather.
10. Scarlet fever, measles, typhoid fever, diphtheria, bronchitis in children.
11. None assigned.
12. Diarrhea, pneumonia.
14. Typhoid fever in Oct., Nov., Dec., Measles during Feb. and June, bronchitis the whole year.
15. Diarrhea, summer months, measles, during Jan., March, April, May, July, Aug., Sept., and Oct.
16. Jan., measles, scarlet fever; diphtheria in Feb. and Nov. Typhoid fever, Aug., Sept., Oct., Nov., Dec. Whooping cough, Jan. to June.
17. Scarlet fever, 13; typhoid fever, 20; measles and whooping cough, hundreds; diphtheria, 2.
18. Small-pox, cholera, cerebro-spinal meningitis.
19. Yes, measles and whooping cough.
20. Yes, contagious fevers, measles and whooping cough. Ceased during the vacation.
21. *January:* Bronchitis, scarlet fever, whooping cough.
February: Bronchitis, scarlet fever, whooping cough, measles, diphtheria (1 case).
March: Measles, bronchitis, whooping-cough.
April: Measles, whooping-cough, bronchitis, diarrhea.
May: Measles, whooping-cough, diarrhea.
June and *July:* Diarrhea, whooping-cough, measles.
August: Diarrhea, typho-malarial, typhoid fever, measles.
September: Typhoid fever, diarrhea, bronchitis.
October: Typhoid fever, bronchitis.
November: Typhoid fever, bronchitis, pneumonia, rheumatism (1 case), diphtheria (1 case).
December: Typhoid fever, pneumonia, bronchitis.
22. No diseases among horses, and we have not hogs enough around to notice their sickness.
24. About the middle of October I attended 22 persons who were attacked with vomiting and diarrhea, colic, etc., after eating liver sausage, in which hog flesh is mixed, and of which I believe, it forms the largest part. One very noticeable series of cases occurred in the family of one Mr. C.: The grand-parents, aged about 60 respectively, the mother and a nursing baby, and five other children were all attacked in the same manner as described above, after partaking freely of liver sausage. Mr. C. did not eat any, and was the only member of the family who did not eat it, and was the only one who did not suffer from pork-liver-sausage-cholera. The cases all yielded readily to a mild aperient followed by opiates. Those 22 cases all occurred within the space of 4 days.
26. No. Potatoes gave an excellent crop.
27. Do not raise any.
28. Have none to be affected.
29. No wheat threshed in this county.
30. No wheat raised in this county.
31. Hay was excellent.
32. *January, February, March:* Cold and frequent snow storms.
April: Fine weather.
May: Rain and fine weather alternately.
June, July, August: Dry, warm.
September: Rainy and warm.
October: Rain, snow, and cold.
November and *December:* Exceedingly fine. Not one snow storm during the months.
33. The soil was very dry from May to September.
36. No wells. We have only a few wells in the township,—they were all dry. In village cannot strike water even at 50 feet,—all sand.
37. No wells in village,—cannot strike water. In township, varies from 1 foot to 90.
39. At no time.
40. Yes,—everything was dried up.
42. It was imported from Marquette Co. in 1880, and prevailed here till March, 1881.
43. We can trace the cases to no contagious cause whatsoever.
44. Shoot the village and township boards, and elect men who know the value of sewerage.

Very respectfully
J. E. SCALLON, M. D.
Hancock, Houghton Co., Jan. 13, 1882.

REPLIES BY MASON W. GRAY, M. D., OF NONESUCH, MICH.

1.† Not incorporated, about 25.
2. Three.
3. Carp Lake township, Ontonagon Co., Mich.
4. About same as the average.
5. About same.
6. Typhoid fever.
7. Typhoid fever, probably caused by defective drainage.
8. I cannot say that any.
14. Typhoid fever in October and November.
16. Typhoid fever was never before known here.
17. Scarlet fever 3, typhoid fever 8.
18. Small-pox, cholera, measles, whooping-cough, cerebro-spinal meningitis, diphtheria.
19 and 20. No.
21. *October:* Typhoid fever, diarrhea, bronchitis.
November: Bronchitis, influenza, typhoid fever, scarlet fever.
December: Bronchitis, influenza, neuralgia, typhoid fever, scarlet fever, tonsilitis.
22. No animals but horses and a few cows were kept here last year. So far as I can ascertain, no disease was known among them.
23. No.
26. No cereals and grasses are raised here; potatoes, garden productions, and small fruits unaffected.
27. None raised.
32. *October:* Occasional sunshine and warm weather, but most of the month wet.
November: Very rainy and cold, with some snow in latter part of month.
December: Ground completely covered with snow; continuous cold.
33. The whole year was unusually wet and rainy. After I came here in October, no dry weather.

† The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 282-305 of this Report. A summary of the replies is printed on pages 283-305.

34. It is said no month of 1881 was unusually dry here, but all unusually wet.
35. All.
36. Cannot answer for each month. Only one well here,—present depth of water (May, 1882) 23 feet.
37. Only one well here, which is about 80 feet deep. It is on a small hill, with a heavy clay subsoil. Surrounding country has but from 1 to 5 feet of earth over bed rock.
41. Surface drainage was very defective, and sewage was left standing in poorly-constructed receptacles.
42. Scarlet fever was present here the previous year, but not in the house where it appears this year, nor in same family,—did not extend beyond the family where it first appeared. No more definite facts regarding introduction.
43. Did not appear.
These replies are necessarily imperfect, owing to my not being here all the year.

MASON W. GRAY.

Nonesuch, Ontonagon Co., L. S., Mich., May 16, 1882.

WESTERN DIVISION OF THE STATE.*

REPLIES BY J. F. DENSLOW, M. D., OF MUSKEGON, MICH.

1.† 14,400.
2. 325.
3. Township.
4. Increased one-third over previous years.
5. Greater.
6. Malaria, scarlet fever, typhoid fever, and rheumatism.
7. An extra fall of water coming in contact with saw dust and slabs and fermenting.
8. Diphtheria.
10. Scarlet fever.
11. Malaria.
17. Cholera, 4; scarlet fever, 30; typhoid fever, 80; measles, 23; whooping-cough, 18; cerebro-spinal meningitis, 3; diphtheria, 25.
18. Small-pox.
19. No.
20. No.
21. *January and February:* Ague, measles, typhoid fever, mumps, erysipelas.
March: Ague, measles, typhoid fever, erysipelas.
April: Remittent fever, intermittent fever, typhoid fever, erysipelas.
May: Remittent fever, intermittent fever, typhoid fever.
June: Remittent fever, intermittent fever, typhoid fever, diphtheria.
July, August, and September: Remittent fever, intermittent fever, typhoid fever, diphtheria, scarlet fever.
October: Remittent fever, intermittent fever, typhoid fever, diphtheria.
November and December: Remittent fever, intermittent fever, erysipelas, diphtheria, scarlet fever.
22. Pink-eye.
23. No.
27. Good.
31. No.
32. *January and February:* Cold; dry air.
March and April: Cloudy and rainy.
May, June, and July: Fair.
August: Rainy.
September: Rainy at times.
October: Mild.
November and December: Rainy.
33. May, June, July, October, September, August, November, April, March, January, February, December.
34. July.
35. March and October.
39. March.
40. July.
41. Malaria.
42 and 43. Filth.

Very respectfully,
J. F. DENSLOW, M. D.

Muskegon, Muskegon Co., January 25, 1882.

BAY AND EASTERN DIVISION OF THE STATE.*

REPLIES BY A. MITCHELL, M. D., OF BROCKWAY CENTER, MICH.

2.† 27.
3. Townships of Brockway, Lynn, Speaker, Fremont, Greenwood, and Maple Valley.
4. Very little less than usual.
5. About the average.
6. Diphtheria.
8. Malarial.
9. To the country being better drained.
14. Diphtheria.
16. Diphtheria, typhoid fever.
17. Scarlet fever, 38; typhoid fever, 26; measles, 48; whooping cough, 60; cerebro-spinal meningitis, 7; diphtheria, 64.
18. Small-pox, cholera.
19. Yes. Scarlet fever, measles, diphtheria.
21. *January* and *February:* Pneumonia.
April: Scarlet fever.
May: Scarlet fever and diphtheria.
June: Scarlet fever.
July: Whooping-cough.
September: Diphtheria.
October: Diphtheria, typhoid fever.
November: Typhoid fever, diphtheria.
December: Diphtheria, typhoid fever.
23. No.
24. I do not.
26. None.
27. Good.
28. No.
29. Yes.
30 and 31. No.
34. July, August, and September.
35. At no time.
36. Jan. and Feb., 15; March and April, 18; May, 15; June, 10; July, 8; Aug., 6; Sept. 3; Oct., 7; Nov., 10; Dec., 15.
37. From 3 to 20 feet.
39. At no time.
40. August and September.
42 and 43. The facts are not known.

Very Respectfully,
A. MITCHELL, M. D.

Brockway Center, St. Clair Co., Jan. 14, 1882.

REPLIES BY W. H. SMITH, M. D., OF ST. CLAIR, MICH.

1.† City, 2,000.
2. 22.
3. City of St. Clair. The replies relative to crops and animals refer to adjacent country.
4 and 5. Have no data for comparison.
6. Diphtheria.
8. Scarlet fever.
9. Prompt isolation of the first case.
10. Diphtheria.
12. Scarlet fever.
13. Isolation of first case promptly.
14. Diphtheria, 4 cases in Sept. and Oct., all fatal; cerebro-spinal meningitis, 3 cases, 2 in Sept. and 1 in Dec., all fatal.
16. Diphtheria in Sept. and Oct.
17. Scarlet fever, 1; typhoid fever, 2; whoop-

* For counties included in each division, see Exhibit 1, page 287.

ing-cough, 8; cerebro-spinal meningitis, 3; diphtheria, 4.

18.† Small-pox, cholera, and measles.

19. I think not. Possibly diphtheria may have been thus conveyed.

20. No.

21. *January, February, March,* and *April:* I have not the facts for these four months, as they were prior to my term of office.

May: Roseola, 5; intermittent fever, 4; tonsilitis, 2; bronchitis, 2; consumption, 1; rheumatism, 1; paralysis, 1.

June: Intermittent fever, 5; consumption, 1; dysentery, 1; pneumonia, 1; rheumatism, 1; bronchitis, 1; tonsilitis, 1; diarrhea, 1.

July: Dysentery, 3; diarrhea, 3; intermittent fever, 2; consumption, 2; remittent fever, 2; cholera infantum, 2; gastritis, 1.

August: Diarrhea, 5; cholera infantum, 4; dysentery, 8; intermittent fever, 5; remittent fever, 2; consumption, 2; cholera morbus, 1; enteritis, 1; pelvic cellulitis, 1.

September: Intermittent fever, 4; diarrhea, 3; chicken-pox, 3; whooping-cough, 3; consumption, 2; cerebro-spinal meningitis, 2; dysentery, 2; cholera morbus, 1; cholera infantum, 1; typhoid fever, 1; erysipelas, 1; bronchitis, 1; tonsilitis, 1; diphtheria, 1.

October: Diphtheria, 3; tonsilitis, 3; pharyngitis, 2; whooping-cough, 2; consumption, 2; enteritis, 1; dysentery, 1; intermittent fever, 1; typhoid fever, 1; rheumatism, 1.

November: Consumption, 2; pharyngitis, 2; typhoid fever, 1; rheumatism, 1; whooping-cough, 1; tonsilitis, 1; intermittent fever, 1; bronchitis, 1; gangrenous sore throat, 1.

December: Consumption, 2; pharyngitis, 1; intermittent fever, 1; dropsy, 1; tonsilitis, 1; cerebro-spinal meningitis, 1.

22. A disease called by the farmers "splenic fever," prevailed extensively among the sheep in Jan., Feb., March, and April. No hog cholera occurred.

23. No.

24. None.

25. None occurred.

26. None occurred; season too dry.

27. First-class.

28. No.

29. Yes.

30. None probably.

31. Less; none injured.

32. *January:* Snow and rain on 20 days, 2.15 in. Temperature, mean 14.46°, max. (13th) 35°, min. (11th) 14°. Barometer (32°), highest 29.948 in., lowest 28.818. Prevailing wind, westerly. Snow fall, 25 inches.

February: Snow and rain on 16 days, 3.95 in. Snow fall, 17 in. Temperature, mean 20.01°, max. (10th) 47°, min. (2d)-17°. Barometer, highest (6th) 29.984 in., lowest (12th) 28.610 inches. Wind variable. Lightning on 26th.

March: Rain and snow on 15 days, 3.10 in. Snow fall, 24 in. Temperature, mean 29.13°, max. (24th) 45°, min. (2d) 6°. Barometer, highest 29.570 in., lowest 28.625 in. Prevailing wind, northerly.

April: Rain and snow on 10 days, .76 in. Snow fall, .472 in. Temperature, mean 39°, max. (24th) 78°, min. (5th) 10°. Barometer, highest 29.689 in., lowest 29.02 in. Prevailing wind, northerly.

May: Rain on 8 days, 2.43 in. Temperature, mean 59.45°, max. (12th) 90°, min. (3d) 28°. Barometer, highest 29.718 in., lowest 28.965 in. Prevailing wind, northerly. Violent storm, wind, rain, and hail, on 14th.

June: Rain on 11 days, 2.64 in. Temperature, mean 60.07°, max. (28th) 89°, min. (22d) 37°. Barometer, highest 29.497 in., lowest 28.925 in. Prevailing wind, northeast. Thunder and lightning on 12th, 16th, 28th, and 30th.

July: Rain on 8 days, 2.13 in. Temperature, mean 71.80°, max. (9th) 98°, min. (2d) 47°. Barometer, highest 29.443 in., lowest 28.994 in. Wind northerly. Thunder and lightning on 5th, 12th, 24th, 25th, and 31st.

August: Rain on 4 days, .8 in. Temperature, mean 70.4°, max. (12th) 100°, min. (23d) 40°. Barometer, highest 29.568 in., lowest 28,948 in. Northerly winds prevail. Thunder and lightning on 6th and 31st. White frost on morn of 23d.

September: Rain on 10 days, 3.61 in. Temperature, mean 69.88°, max. (6th) 99°, min. (12th) 41°. Barometer, highest 29.559, lowest 29.018 in. Prevailing wind, easterly. Thunder and lightning on 1st, 23d, 27th, and 30th. Temperature above average.

October: Rain on 20 days, 5.57 in. Temperature, mean 51.88°, max. (15th) 75°, min. (21st) 29°. Barometer, highest 29,743 in., lowest 28.934 in. Easterly winds prevailing. Thunder and lightning on the 17th.

November: Rain and snow on 20 days, 2.75 in. Temperature, mean 38.25°, max. (8th) 60°, min. (24th) 19°. Barometer, highest 29.864 in., lowest 28.81 in. Prevailing winds, southwest.

December: Rain and snow on 15 days, 2.8 in. Temperature, mean 34.08°, max. (28th) 50°, min. (15th)-13°. Barometer, highest 29.81 in., lowest 28.81 in. Prevailing winds, westerly.

34. June, Aug. drier than any year since 1867.

35. October.

36. In August many wells went dry.

37. Eight to 10 feet on flats. Wells on hill are in clay and supplied with surface water.

40. August and September.

42. The only case probably produced from germs remaining from the year before.

43. Four cases in three families. First family, prior to attack, had been visiting in a neighboring village. No proof that they came in contact with any diphtheritic persons, but may have done so. Second family had children in school where children from first family were attending. Children from the first family were in school with the little girl in the third family who was attacked.

44. The restriction of medical practice to qualified persons would lessen the amount of sickness and probably also diminish the number of deaths. Quite a percentage of the cases which come to me for treatment are patients whose ailments at the outset were slight, but who consulted pretenders to medical knowledge and were seriously injured by the drugs administered. Very respectfully, W. H. SMITH.

St. Clair, St. Clair Co., Feb. 9, 1882.

REPLIES BY JOHN S. CAULKINS, M. D., OF THORNVILLE, MICH.

3 † The township of Dryden and contiguous parts of Metamora, Lapeer, and Attica.

4. About the same as the average of previous years.

5. Certainly not increased; probably an average.

6. Cerebro-spinal meningitis, a disease not usually prevalent, was the cause of several deaths. Some contagious diseases were very prevalent, but not productive of any mortality.

7. No cause can be assigned for the outbreak of cerebro-spinal fever. The conditions, aside from personal contact, which favor the spread of contagious diseases are not well understood.

8. None prominently so.

† The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 283-305 of this Report. A summary of the replies is printed on pages 283-305.

10.† Typhoid fever showed a larger mortality than had been observed for several years.
11. The protracted drought and low level of the water in the ground may be the cause of the unusual mortality.
12. The extensive epidemic of measles was unattended with any mortality.
13. Merely to mildness in type of the disease.
14. The typhoid fevers began about the 1st of October and lasted the rest of the year.
15. The epidemic of measles, without any fatal case, began with the year and lasted till the hot weather came.
16. The outbreak of cerebro-spinal meningitis was about the 1st of November.
17. Scarlet fever, 10; typhoid fever 20; measles, 400; whooping-cough, 75; cerebro-spinal meningitis, 4; diphtheria, 14. Measles and whooping-cough are estimated.
18. Small-pox and cholera.
19. Yes; measles.
20. According to my observation, the closing of the schools during the prevalence of an epidemic of the communicable diseases is a necessary and efficacious measure.
21. *January:* Influenza, scarlet fever, malarial fevers.
February: Measles, scarlet fever, influenza, malarial fevers.
March: Measles, influenza, diphtheria, malarial fevers.
April: Measles, rötheln, influenza, malarial fevers.
May and June: Rötheln, measles, malarial fevers.
July: Rötheln, malarial fevers, measles.
August: Diarrhea, rötheln, dysentery, malarial fevers.
September: Diarrhea, dysentery, malarial fevers.
October and November: Intermittent fever, typho-malarial fever, diarrhea.
December: Tonsilitis, typho-malarial fever, intermittent fever.
22. No hog-cholera or epizootic of any kind occurred in this section of the country, except horse-distemper, and that not widely prevalent.
23. No epidemic prevailed among the animals named.
24. No such facts have been noticed.
25. No such cases are known to me.
27. The condition of all the crops of 1881, when ready for the market, has never been excelled.
28. Oats were affected by smut.
29. Yes.
30 and 31. Less.
32. *January:* A very cold month, having 10 days in which the mercury was below zero.
February: A cold month; 5 days below zero.
March: Cold, with very low bar. pressure.
April: Cold, dry, and backward.
May: Dry and sunny.
June: Dry and cool; 4 frosty nights; mean temp. below May.
July: Dry and hotter than the long average for the month.
August: Dry and hot; 4 days 100° and upward.
September: First 10 days dry, hot, and smoky; then cooler, with frequent rains.
October: Warm and moist.
November: Wet and cloudy; temp. moderate for the season.
December: Warm for the season; scarcely colder than November; 6 nights did not freeze.
33. July, August, May, April, June, December, February, January, March, September, October, November.
34. In every month of the year.
35. In none.
36. The average depth of water in wells cannot be given for lack of measurements, none but my own having been measured.
37. From 15 to 100 feet.
38. Jan., 17 ft. 11 in.; Feb., 17 ft. 4 in.; March, 17 ft.; April, 16 ft. 6 in.; May, 16 ft. 6 in.; June, 16 ft. 5 in.; July, 17 ft. 5 in.; Aug., 17 ft. 6 in.; Sept., 17 ft. 9 in.; Oct., 17 ft. 8 in.; Nov., 17 ft. 6 in.; Dec., 17 ft. 9 in.
39. In none.
40. In every one.
42. Scarlet fever occurred in this locality in the year 1881 in two series of cases, in both of which it was easy to account for the way in which it was introduced and communicated. In the first series the poison was brought by a young man who had been working at a lumber camp in the north part of the State, in which the disease was prevailing. He came back very sick with it himself, and infected the children of the family with whom he made his home. Although it was in the coldest weather of the year, in January, the vigorous measures of isolation and disinfection which were taken squelched out the disease so that it spread no further than that family. In the second series of cases the history of its introduction is this: A woman having with her an unprotected child, coming home from a neighboring village, stopped at, and was allowed to go into, a house where there were some cases of scarlet fever. The child, a little girl of six years, brought away with her the seeds of the disease, and in turn infected the children of two other families.
43. Diphtheria occurred in three series of cases, with a mortality of six out of a total of fourteen cases. In none of these can the way in which the first case was contracted be accurately accounted for; but in one, and the worst instance two children died who had just returned with their parents from a visit to a neighborhood where within a very few weeks there had been fatal cases of diphtheria. In cases subsequent to the first the source of infection was easily traceable.

Very respectfully,
JOHN S. CAULKINS.
Thornville, Lapeer Co., Mich.

CENTRAL DIVISION OF THE STATE.*

REPLIES BY G. W. TOPPING, M. D., OF DE WITT, MICH.

1.† An unincorporated village, population 384.
2. Two.
3. Township of De Witt, Clinton Co., Mich.
4. Fifteen per cent greater.
5. About the same.
6, 8, 10 and 12. None.
14. No two deaths from same cause.
15. None in particular.
16. Sun stroke, July 14; measles occurred from April 17 to July 12; membranous cramp, June 17.
17. Scarlet fever, 1; typhoid fever, 3; measles, 58; diphtheria, 15.
18. Small-pox, cholera, whooping-cough, cerebro-spinal meningitis.
19. Yes. Measles.
20. Yes. In connection with measles.
21. *January:* Bronchitis, tonsilitis, pneumonia, rheumatism, neuralgia, intermittent fever, spasmodic croup, consumption.
February: Bronchitis, tonsilitis, pneumonia, neuralgia, rheumatism, remittent fever, spasmodic croup, consumption.
March: Bronchitis, pneumonia, tonsilitis, rheumatism, neuralgia, remittent fever, croup, spasmodic croup.
April: Bronchitis, tonsilitis, neuralgia, pneumonia, rheumatism, intermittent fever, remittent fever, spasmodic croup, consumption.

*For counties included in each division, see Exhibit 1, page 287.

May: Measles, bronchitis, intermittent fever, remittent fever, tonsilitis, pneumonia, neuralgia, diarrhea, rheumatism.
June: Measles, intermittent fever, bronchitis, remittent fever, tonsilitis, neuralgia, diarrhea, consumption, rheumatism.
July: Measles, intermittent fever, remittent fever, bronchitis, diarrhea, cholera morbus, tonsilitis, neuralgia.
August: Diarrhea, intermittent fever, dysentery, remittent fever, cholera morbus, cholera infantum, typhoid fever.
September: Diarrhea, dysentery, intermittent fever, remittent fever, bronchitis, neuralgia, diphtheria, cholera infantum.
October: Bronchitis, diarrhea, intermittent fever, remittent fever, tonsilitis, dysentery, rheumatism, consumption, neuralgia.
November: Bronchitis, intermittent fever, tonsilitis, remittent fever, rheumatism, diarrhea, neuralgia, consumption.
December: Bronchitis, tonsilitis, pneumonia, rheumatism, neuralgia, intermittent fever, spasmodic croup, consumption.

22. Distemper or strangles occurred extensively in the spring among horses. Symptoms: swelling under jaw, fever, and purulent discharge from nose.
23. No hog cholera.
24. No injurious effect from eating meat of any kind.
25. I know of none.
26. Corn was often smutty. No other disease of crops.
27. In good condition.
28. No.
29. Yes.
30 and 31. Less.
32. *January:* Coldest month of year. Snow about 21st, but no sleighing.
February: Second coldest month. First week the coldest of year; little snow.
March: Moderate, with little snow.
April: Mild and dry.
May: Warm, with rains about 10th and 30th.
June: Cool for season; frequent rains.
July: Warm, and very dry.
August: Hot and dry.
September: Hot and showery.
October: Temperature moderate; much rain.
November: Cold, with early snow.
December: Mild and dry; ground froze last of month.
34. April, August, and December.
35. October and November.
37. Varies from 10 to 80 feet, according to elevation.
38. Varies according to elevation; 10 to 80 feet.
39. October and November.
40. August and September.

G. W. TOPPING.

De Witt, Clinton Co., Mich., May 25, 1882.

REPLIES BY J. MARSHALL, M. D., OF GAINES, MICH.

1.† 550.
2. One.
3. Village of Gaines.
4. One-half less.
5. Less.
18. Small-pox, cerebro-spinal meningitis, scarlet fever, cholera.
19 and 20. No.

Very respectfully, J. MARSHALL, M. D.

Gaines, Genesee Co., Mich.

REPLIES BY A. P. DRAKE, M. D., OF HASTINGS, MICH.

1.† 2,700.
2. About eighty.
3. From five to six miles radius from city.
4. Increased about one-half.
5. Increased fully one-third.
6. Diphtheria.
7. A wet spring followed by a hot, dry summer.
8. Don't think there was any.
10. Diphtheria.
11. A wet spring followed by a hot, dry summer.
12. Do not think there was any.
14. Diphtheria, mostly in September and the forepart of October.
17. Typhoid fever, a few; measles, 20; whooping-cough, 50; diphtheria, 200. These figures are only approximate.
18. Small-pox, cholera, scarlet fever, cerebro-spinal meningitis.
19. It was thought by the city board of health that diphtheria was so propagated.
20. The public schools were closed for a time on account of diphtheria, but I am not prepared to say that it had anything to do with the abatement of the disease.
22. Not any.
23. No.
25 and 26. No.
27. First-class.
28. No.
29. Yes.
30 and 31. Not at all.
34. July and August.
35. April and May.
37. From 20 to 70 feet, according to hight of land above the river.
42. No scarlet fever.
43. Supposed to have been brought here by persons coming from a place where it was prevalent, although it has occurred sporadically here for years. Very respectfully,

A. P. DRAKE, M. D.

Hastings, Barry Co., Feb. 23, 1882.

REPLIES BY H. H. CHASE, M. D., OF LINDEN, MICH.

1.† Incorporated village. 700 population.
2. Five.
3. North half of Fenton township; south half of Mundy township; east quarter of Gaines township. In all one and one-half towns and one village.
4. Same as average.
5. Greater. Increased probably thirty-three and one-third per cent.
6. Diphtheria; remittent fever; acute pharyngitis; typho-malarial fever.
7. Disbelief in contagiousness, and consequent carelessness.
8. Malarial, except remittent variety.
9. Increased virulence of malarial poison, and lessened vitality, changing the malarial type to a continued form.
10. Diphtheria.
11. Apparent loss of vitality in respiratory tract, the throat and lungs being unusually susceptible to morbific influence.
12. None in particular.
13. Diminished severity of attacks of most diseases, except those above mentioned.
14. Diphtheria epidemic, commencing in May, 1881, extending throughout the year.
15. None.
16. Diphtheria, as cited before.
17. Typhoid fever, 1; diphtheria 39; also, about six cases of dysentery.

†The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 282-305 of this Report. A summary of the replies is printed on pages 283-305.

18.† Small-pox, cholera, scarlet fever, measles, whooping-cough, cerebro-spinal meningitis.

19 and 20. No.

21. In the entire locality with which I am acquainted, no disease in particular had any special run, except diphtheria, which was quite prevalent during May, and June, and July. None of them occurred in Linden, but the epidemic was in northern part of Fenton, southern and western of Mundy and throughout Gaines townships.

22. Nothing unusual occurred.

23. No.

24. I know of none.

25. None.

26. Potato rot unusually prevalent thoughout this region.

27. Fair.

28. No.

29. Yes.

30. Have heard of none.

31. As usual.

32. *January, February, March and April:* For these months I kept no account of rainfall.
May: Moisture increasing.
June: Grew very dry.
July: Very dry.
August: Still less dry.
September: Less dry.
October: Quite wet.
November: Wettest month.
December: Not so wet as November.

33. July, September, August, May.

34. June, July, August.

35. February, October, November.

36. Jan., Feb., March, and April, 6; May 7; June 6; July 5; August 4¾; Sept. 4; Oct. 4¾; Nov. and Dec. 6. This is for my own well, 30 ft. deep.

37. 20 to 25 feet.

38. Jan., Feb., March, and April, 24; May, 23; June, 24; July, 25; Aug., 25¾; Sept., 26; Oct., 25¾; Nov. and Dec., 24. Measurements made from my own well.

Very respectfully,
H. H. CHASE.

Linden, Genesee Co., Mich., May, 1882.

REPLIES BY C. A. WISNER, M. D., OF OTISVILLE, MICH.

1.† About five hundred.

2. About 20.

3. Village of Otisville and vicinity.

4 and 5. Average about the same as previous years.

6. Diphtheria and typhoid fever.

7. Atmospheric conditions and other causes more favorable for their development.

10. Typhoid fever and diphtheria.

11. None besides the condition of the atmosphere.

12 Could not say, only having resided here since July, 1881.

14. Typhoid fever October 3, diphtheria Nov. 25 to Dec. 15.

15. Measles during the month of July, diphtheria during month of August.

16. None.

17. Typhoid fever 5, measles epidemic during summer, diphtheria 26.

18. Small-pox, cholera, scarlet fever, whooping-cough, cerebro-spinal meningitis.

19 and 20. No.

21. I have no records for the first six months.
July: Measles, diarrhea, intermittent fever, pulmonary consumption, diphtheria, rheumatism, cholera infantum, and pneumonia.
August: Diphtheria, diarrhea, remittent fever, intermittent fever, cholera infantum, rheumatism, neuralgia, pneumonia.
September: Diarrhea, cholera morbus, intermittent fever, remittent fever, dysentery, rheumatism, diphtheria, consumption pulmonary.
October: Intermittent fever, diarrhea, rheumatism, neuralgia, typhoid fever, diphtheria, consumption, tonsilitis.
November: Diphtheria, rheumatism, intermittent fever, tonsilitis, neuralgia, enteritis, pulmonary consumption.
December: Diphtheria, tonsilitis, rheumatism, intermittent fever, neuralgia, erysipelas, influenza, bronchitis, consumption pulmonary.

22. No unusual disease.

23. No.

24 and 25. Do not know of any.

26. None.

27. Good.

28. No

29. Yes.

30 and 31. Less.

33. September, August, July, June, May, October, November, April, December, January, February, and March.

34. August and September.

35. At no time.

37. 4 to 12 feet.

38. About the middle of August to the middle of September nearly all the wells and small streams were perfectly dry.

39. At no time.

40. August and September.

42. None has occurred during the portion of the year that I have been located here.

43. To all appearances most of the cases were sporadic; a few were due to contagion.

Very respectfully, C. A. WISNER, M. D.

Otisville, Genesee Co., Feb. 13, 1882.

REPLIES BY G. E. CORBIN, M. D., OF ST. JOHNS, MICH.

1.† Two thousand five hundred.

2. Fifty-five, by actual record kept.

3. For the incorporated village of St. Johns.

4. Doubled, at least.

5. More than doubled.

6. Diphtheria, measles, cholera infantum.

7. Extremes of temperature must have been one cause of mortality. Mercury was between 90 and 100° F. when cholera infantum prevailed; was 100° F. in shade Aug. 5, 1881; Feb. 25, 1881, mercury was -18° F., a range of 118° F. during the year.

10. Measles proved more than usually severe and fatal.

14. Measles prevailed in March, April, and May, and were most fatal during the latter half of that time.

16. Diphtheria and measles. Many deaths from diphtheria.

17. Measles, many; diphtheria, fully 200 cases during 1881, and 24 deaths from diphtheria from Aug. 13 to Dec. 31, 1881. From Aug. 13, 1881, to March 20, 1882, we record 41 deaths in our village from diphtheria alone, and no abatement in the disease yet.

18. Small-pox, cholera, cerebro-spinal meningitis.

19. Yes. Measles, without doubt. We are not certain that diphtheria has been thus spread.

20. No All our primary departments have been closed and reopened several times within the last six months, the date of writing being March 20, 1882.

21. *March, April, and May:* For these months, measles were most prevalent of any disease.
August, September, October, November, and December: For these months, diphtheria was most prevalent and most fatal of any prevailing disease, and it continues to be up to the date of the present writing. This includes Jan., Feb., and March, 1882. No season of the year is peculiar to diphtheria.

22. None.

23. No.

26.† None that I know of.
27. Good.
29. Yes.
31. Less, as it was excessively dry at the season of harvesting wheat and hay.
32. Perpetual sleighing for just 60 days from Jan. 14, 1881; none before or after. Ground steadily frozen from Nov. 1, 1880, to March 20, 1881. No rain of any consequence during the months of June, July, and August. Ground dry and parched until middle of September.
33. August, July, June, September, December, October, November. From general observation and record, without actual measurements.
34. August and July.
36. Our wells are constantly filling in with quicksand at the bottom, and have to be frequently deepened.
37. See page 201 of Annual Report of State Board of Health, 1877, question 27.
39. Our well water is all found in quicksand at a level which varies but little from month to month, or year to year.
40. The level of our water-supply was, perhaps, a little lower during August and September than is usual. Not much.
43. The first case here was in the person of a boy who had been spending a few weeks with an uncle who resides in the country. Near the residence of the uncle a poor family entered an old house, and soon the children of this poor family were all taken sick. No physician was called for several days. Finally their disease was found to be diphtheria. In the meantime, neighbors had been exposed. The poor family came from some remote county where diphtheria had been prevailing. The best of precautions were taken, and we can not trace the spread of the disease in this village to any exposure to the first case here imported. There may have been other cases imported. Some children here, well cared for and closely quarantined, have had the disease. We can not trace one-fifth part of the cases here to any direct exposure. Many exposures, also, without contracting the disease. Several deaths among adults from the disease.

Very respectfully, G. E CORBIN, M. D.

St. Johns, Clinton Co., March 20, 1882.

REPLIES BY D. A. MCLEAN, M. D., OF STANTON, MICH.

1.† 2500.
2. 21.
3. City of Stanton and immediate vicinity.
4. About one-fourth greater.
5. Greater.
6. Typho-malarial fever.
8. Dysentery, cholera infantum.
10. Typho-malarial fever.
12. Dysentery, cholera infantum.
14. Typho-malarial fever, from about August 1, to close of year.
15. Dysentery, cholera infantum,—July, August, and September.
16. Diphtheria—September, October, and November.
17. Measles 10, diphtheria 8.
18. Small-pox, cholera, scarlet fever, typhoid fever, cerebro-spinal meningitis.
19 and 20. No.
21. *January:* Remittent fever, pneumonia, tonsilitis, neuralgia.
February and March: Remittent fever, pneumonia, neuralgia, rheumatism.
April: Intermittent fever, remittent fever, neuralgia, measles.
May: Intermittent fever, remittent fever, measles.
June: Intermittent fever, remittent fever, diarrhea.
July: Intermittent fever, remittent fever, diarrhea, dysentery, cholera infantum.
August: Intermittent fever, remittent fever, typho-malarial fever, diarrhea, dysentery, cholera infantum.
September: Intermittent fever, remittent fever, typho-malarial fever, diarrhea, dysentery, cholera infantum, diphtheria.
October: Remittent, intermittent, and typho malarial fevers, diarrhea, diphtheria.
November: Remittent, intermittent, and typho malarial fevers, diphtheria.
December: Typho-malarial, remittent, and intermittent fevers, diphtheria, pneumonia, rheumatism.
23 and 24. No.
25. I do not.
27. Wheat in good condition, buckwheat damaged by wet weather.
29. Yes.
31. Think "less."
33. July, August, May, September, October, April, June, November, December, February, March, January.
34. May, July, August.
36. September, October, November.
37. About 25 feet.
39. September, October, November.
40. July, August.
43. Accumulated filth in one instance, damp cellar in another. No communication of disease.

Very respectfully,
DONALD A. MCLEAN, M. D.

Stanton, Montcalm Co., May 6, 1882.

REPLIES BY R. B. SMITH, M. D., OF WEBBERVILLE, MICH.

1.† 500.
2. Ten.
3. Township of Leroy, including village of Webberville.
4 and 5. About the same.
6. Typhoid fever.
8. None.
10. Typhoid fever.
11. Severe type of the disease.
12. None.
14. Typhoid fever; Oct., Nov., and Sept.
15. None.
16. Typhoid fever, in Sept., Oct., and Nov.
17. Scarlet fever, 3; typhoid fever, 5; measles, 22; whooping-cough, 2; diphtheria, 4.
18. Small-pox, cholera, cerebro-spinal meningitis.
19 and 20. No.
21. *January:* Bronchitis, Remittent fever, Rheumatism, typhoid fever, scarlatina, influenza, diarrhea, diphtheria, intermittent fever.
February: Influenza, tonsilitis, intermittent fever, neuralgia, rheumatism and diarrhea, typhoid fever.
March: Tonsilitis, influenza, intermittent fever, neuralgia, bronchitis, measles, remittent fever, consumption.
April: Intermittent fever, remittent fever, measles, pneumonia, rheumatism, bronchitis, diarrhea.
May: Intermittent fever, measles, bronchitis, influenza, pneumonia, remittent fever, whooping-cough.
June: Intermittent fever, measles, bronchitis, diarrhea, pneumonia, whooping-cough, rheumatism.
July: Intermittent fever, diarrhea, cholera morbus, dysentery, bronchitis, neuralgia, pneumonia, rheumatism.
August: Intermittent fever, diarrhea, influenza, cholera-morbus, dysentery, rheumatism, remittent fever, inflammation of the bowels.

† The figures beginning paragraphs refer to questions in Circular 50, printed (in small type), on pages 282–305 of this Report. A summary of the replies is printed on pages 283–305.

September: Intermittent fever, remittent fever, diarrhea, typhoid fever, rheumatism, cholera-morbus.
October: Remittent fever, intermittent fever, typho-malarial, diarrhea, typhoid, rheumatism, cholera-morbus.
November: Remittent fever, intermittent fever, typho-malarial, typhoid fever, tonsilitis, rheumatism, diarrhea, influenza, pneumonia.
December: Remittent fever, intermittent fever, rheumatism, pneumonia, tonsilitis, diarrhea.

22. None.
23. No.
24 and 25. None.
26. Rot among apples.
27. Good.
28. No.
29. Yes.
30 and 31. No.
33. July, August, June, September, May, October, January, February, November, March, April, and December.
34. July and August.
35. November and December.
37. 10 to 30 feet.
39. March, April, November, and December.
40. July, August, and September.
41. None.
42 and 43. The facts are not known.

Very respectfully,
R. B. SMITH.

Webberville, Ingham Co., Feb. 10, 1882.

REPLIES BY GEORGE PRAY, M. D., OF WOOD'S CORNERS, MICH.

3.† A well settled country, location covering a space of about 10x10 miles. Population about 2,500.
4. About 50 per cent greater.
5. Doubled.
6. Measles, diphtheria, typho-malarial fever, pharyngitis.
7. The unusual prevalence of typho-malarial fever was probably caused by the unusual fullness of the swamps and marshes with water, and the evaporation of the same during the hot and dry months of July, August, and September. The disease was most prevalent on rich alluvial soil and with stiff sub-soil, while sandy localities were comparatively free from it.
10. Diphtheria and typho-malarial fever.
16. Diphtheria from April 1 to end of year, typho-malarial fever from Sept. 15, to end of year; exudative pharyngitis from July 15 to end of year. This disease prevailing at the same time and in the same localities as diphtheria, and evidently contagious, spreading from one family to another, and usually affecting all the members of each family, seems closely allied to that disease, though evidently different as to the character of exudation, severity, and sequelæ. No deaths occurred from it nor was it followed by any serious sequalæ. It maintained well its characteristics from one family to another, and did not to my knowledge degenerate into real diphtheria in any instance.
17. Scarlet fever, 10; typhoid fever, about 4; measles, perhaps 400; cerebro-spinal meningitis, 4; diphtheria, about 60; typho-malarial fever.
18. Small-pox, cholera, whooping cough.
19. Yes,—measles.
20. No,—schools usually closed on account of diphtheria where it prevailed, but I am not aware of any cases being contracted in school, though I have no doubt it would have been further communicated had schools been kept open.
21. *January:* Bronchitis, rheumatism, neuralgia, pneumonia, pharyngitis, erysipelas, apoplexy.
February: Bronchitis, neuralgia, intermittent fever, pharyngitis.
March: Measles, bronchitis, neuralgia, rheumatism, pneumonia, intermittent fever, cerebro-spinal meningitis, consumption.
April: Measles, intermittent fever, neuralgia, rheumatism, diarrhea, consumption, diphtheria, cerebro-spinal meningitis, inflammation of bowels, tonsilitis.
May: Measles, intermittent fever, mumps, neuralgia, rheumatism, diphtheria, bronchitis, consumption, inflammation of bowels, diarrhea, puerperal fever.
June: Measles, intermittent fever, neuralgia, diphtheria, rheumatism, pharyngitis, consumption, bronchitis, diarrhea, dysentery, puerperal fever.
July: Intermittent fever, neuralgia, measles, rheumatism, diphtheria, pharyngitis, consumption, cholera-morbus, inflammation of brain.
August: Diarrhea, intermittent fever pharyngitis, diphtheria, rheumatism, neuralgia, typho-malarial fever, cholera-morbus, bronchitis, consumption.
September: Intermittent fever, diarrhea, typho-malarial fever, dysentery, neuralgia, diphtheria, remittent fever, cholera-morbus, bronchitis, cerebro-spinal meningitis, consumption.
October: Typho-malarial fever, intermittent fever, diarrhea, neuralgia, pharyngitis, diphtheria, cerebro-spinal meningitis, bronchitis, rheumatism, consumption.
November: Typho-malarial fever, intermittent fever, neuralgia, tonsilitis, pharyngitis, diarrhea, rheumatism, inflammation of brain, consumption.
December: Pharyngitis, diphtheria, bronchitis, neuralgia, rheumatism, pneumonia, scarlatina, diarrhea, inflammation of bowels, tonsilitis.
22. No diseases prevailing among animals to my knowledge.
23. No.
24. None.
25. I do not.
26. No disease to my knowledge affecting any crops.
27. Good.
28. No.
29. Yes.
30. Less.
31. Less than usual.
32. No record but to state in a general way,—there was rain in the spring and in June, and very dry through July, August and September. The surface soil became very dry, but notwithstanding swamps and marshes, which for several previous years had been quite dry, many of them remained through this dry period quite full of water, indicating, as was the fact, a less depth of earth above the ground water than for several previous years.
33. August, September July.
34. Surface soil, August, July, September.
35. April, May, June.
36. Generally water much deeper than for several years.
37. From 15 to 80 feet. Average about 25 feet.
39. All months in the year.
40. In no month in the year.
42. But little of it in this locality. The cases under my observation, I believe, originated from pulling up and moving the furniture from an old log house, where a child had died of scarlet fever several years ago. The first case originated in that way, and the others from contagion.
43. One out-break originated as has already been stated in a communication from me to you. The recent out-break from a young woman who was exposed at Stanton, who communicated it to her father's family. The young woman died, and a public funeral was held in her father's house while other members of the family were sick with the disease, and before its real nature was recognized. A whole community exposed

to it in this way, and many affected with the disease.

44. A better and more thorough system of drainage is, in my estimation, the great desideratum in this locality. I believe that thorough drainage of our swamps and marshes would do away with one-half of all the sickness in this region, while a thorough knowledge of the laws of hygiene, and a strict observance thereof, would do away one-half of the remainder.

Very respectfully, GEORGE PRAY.

Ronald, Ionia Co., Jan. 18, 1882.

SOUTH-WESTERN DIVISION OF THE STATE.*

REPLIES BY HENRY F. THOMAS, M. D., OF ALLEGAN, MICH.

1.† Three thousand.
2. Fifty.
3. Village and township of Allegan.
4 and 5. The same.
6. Typhoid, or typho-malarial fever.
8. Malarial.
9. To better drainage.
10. Typhoid, or typho-malarial fever.
12. Malarial.
14. Typho-malarial fever, July, August, and September.
16. Typhoid forms of fever during summer months.
17. Typhoid fever, 25; measles, 6; whooping-cough, 15; diphtheria, 20.
18. Small-pox, cholera, scarlet fever, cerebro-spinal meningitis.
19 and 20. No.
22. No animal disease.
27. Good.
28. No.
29. Yes.
31. No.
35. July.
37. From thirty to sixty feet.
43. No known cause for the first cases. All were of a mild form.

Very respectfully,
HENRY F. THOMAS.

Allegan, Allegan Co., Mich., Jan. 13, 1882.

REPLIES BY JAMES E. FERGUSON, M. D., OF BANGOR, MICH.

1.† 1,400 in village of Bangor.
3. Bangor village and a radius of 3 miles around it.
4. Increased at least 20 per cent.
5. Increased about 25 per cent.
6. Typhoid fever and diphtheria.
7. I think the unusual dry summer followed by a warm wet fall was the cause of so much fevers.
8. None.
10. Diphtheria and typhoid or typho-mal. fev'rs.
11. Nothing but the dry summer and wet fall.
14. Typhoid fever from middle of July to middle of Oct. Diphtheria during months of Oct., Nov., and Dec.
17. Scarlet fever 10, typhoid fever 20, diphtheria, between 50 and 75 cases, generally of rather a mild type—seven deaths.
18. Small-pox, cholera, cerebro-spinal meningitis, whooping-cough.
19. Diphtheria.
20. Our school was closed during nearly all the month of Dec. After its close diphtheria gradually disappeared.
22. I know of none.
27. Good, but not a full crop.
29. Yes.
30. None that I know.
31. No.
37. From 10 to 40 feet, usually about 30 feet.
43. How it was introduced I do not know, but think it was spread through the school.

Very respectfully,
JAMES E. FERGUSON, M. D.

Bangor, Van Buren Co., Jan. 24, 1882.

REPLIES BY ROBERT HENDERSON, M. D., OF DAYTON, MICH.

1.† Three hundred. Not incorporated.
2. Much less than for several years.
3. One-third of the township of Bertrand, Berrien Co.
4 and 5. Greatly decreased.
6. None.
8. Diphtheria, diarrhea, dysentery, pneumonia, typho-malarial fever, and all diseases.
9. To favorable weather for health.
10. None.
12. All diseases which prevail in this section dangerous to health.
13. To favorable weather for health.
14. None.
15. All diseases which prevail in this section of the country.
16. None.
17. Diphtheria, 3.
18. Diphtheria alone was present.
19 and 20. No.
21. *January:* Pneumonia, 6; tonsilitis, 8; billious remittent fever, 6; bronchitis, 4; rheumatism, 6.
   February: Pneumonia, 2; tonsilitis, 6; billious remittent fever, 8; bronchitis, 3; rheumatism, 8.
   March: Diphtheria, 2; pneumonia, 1; typhoid fever, 1; bilious remittent fever, 4; bilious intermittent fever, 10; tonsilitis, 8.
   April: Pneumonia, 2; tonsilitis, 2; bilious intermittent fever, 14; bilious remittent fever, 5; rheumatism, 3.
   May: Pneumonia, 2; tonsilitis, 3; bilious remit. fever, 12; bilious intermit. fever, 10.
   June: Bilious remittent fever, 6; bilious intermit. fever, 9; diarrhea, 4; tonsilitis, 3.
   July: Diarrhea, 16; bilious remittent fever, 6; bilious intermit. fever, 15; tonsilitis, 2.
   August: Diarrhea, 21; bilious remittent fever, 12; bilious intermittent fever, 17.
   September: Diarrhea, 14; bilious remittent fever, 13; bilious intermittent fever, 20.
   October: Typho-malarial, 3; bilious remittent fever, 4; bilious intermittent fever, 20; neuralgia, 3; diarrhea, 10.
   November: Typho-malarial, 1; bilious remittent fever, 8; bilious intermittent fever, 17; rheumatism, 4; tonsilitis, 6.
   December: Rheumatism, 10; tonsilitis, 7; pneumonia, 2.
22. No hog cholera nor epizooty in our region.
23. No.
24. None.
25. Don't know of any such case.
26. Very little of this in this section this year.
27. Wheat was in bad condition, frequently on account of rain about harvest. The others did fairly.
28. Not that I observed.
29. No.
30. Rather more.
31. Less.
37. Average, 32 feet. Many wells 50 feet deep in certain clay streaks. Other wells only 16 feet deep. One good one, 8.
43. It seemed sporadic, as I only knew of three cases; two in one family, one in another.
44. Removing two mill-dams in this section would prevent back-water from forming marshes.

Very respectfully,
ROBERT HENDERSON, M. D.

Dayton, Berrien Co., Jan. 24, 1882.

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*For counties included in each division, see Exhibit 1, page 287.

†The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 282-305 of this Report. A summary of the replies is printed on pages 283-305.

REPLIES BY S. BELKNAP, M. D., OF NILES, MICH.

1.† 4,400.
2. 55 in city, 20 in country.
3. City of Niles and surrounding country.
4. About the same.
5. Increased a small percent.
6. None.
8. Contagious diseases.
9. Sanitation and more care taken to prevent.
10. Consumption.
12. Scarlatina and diphtheria.
13. Milder form of disease.
14 and 15. None.
16. In the months of May and June there were a few cases of what was designated cholerine, mostly among people who had visited Chicago, and upon their return the attack came upon them.
17. Scarlet fever, approximate, 20; typhoid fever, approximate, 5; measles, 30; whooping-cough, 50; diphtheria, approximate, 25.
18. Small-pox, cholera, cerebro-spinal meningitis.
19 and 20. No.
21. *January:* Remittent fever, rheumatism, influenza, tonsilitis, consumption.
February: Influenza, tonsilitis, remittent fever, rheumatism, consumption.
March: Rheumatism, neuralgia, remittent fever, consumption, influenza, pneumonia.
April: Remittent fever, consumption, influenza, rheumatism, pneumonia.
May: Consumption, intermittent fever, rheumatism.
June: Intermittent fever, consumption, cholera morbus (or cholerine).
July: Diarrhea, intermittent fever, cholera morbus, dysentery.
August: Intermittent fever, typho-malarial, diarrhea, dysentery.
September: Intermittent fever, typho-malarial, diarrhea, dysentery, typhoid fever.
October: Typho-malarial, intermittent fever, consumption, typhoid fever.
November: Influenza, intermittent fever, typho-malarial, consumption.
December: Influenza, sore throats, intermittent fever, consumption, mumps, typho-malarial.
22. During January and February, influenza among horses; July, August, and September, cholera among hogs in certain localities; December, the disease called pink-eye among horses.
23 and 24. No.
26. Not known.
27. All in good condition, except short crop of wheat, corn, and potatoes.
28. No.
29. Yes.
30. Less.
31. No.
33. June, July, August.
34. June and July.
35. November and December.
37. From 3 to 40 feet.
39. November.
40. July.
42. Sporadic cases only, and these mild.
43. Sporadic cases only.

Very respectfully,
SIMEON BELKNAP.
Niles, Berrien Co., Mich., Jan. 16, 1882.

REPLIES BY IRWIN SIMPSON, M. D., OF NILES, MICH.

1.† City, 4,200.
2. 70.
3. Niles city and vicinity.
4. Considerably less, as we had no epidemic diseases.
5. 4 or 5 per 1,000 less
6. Consumption, typho-malarial and remittent fevers, and pneumonia.
7. Excessive heat, causing a more severe type of malarial fevers.
8. All except malarial fevers and consumption.
9. I don't know; better management, I suppose.
10. Consumption and malaria.
12. Bronchitis and the infectious diseases.
14. August, September, and October, as being the months when typho-malarial fevers were prevalent.
15. Jan., Feb., March, and April, diseases of the respiratory passages.
16. August, September, October, and November, typho malarial fever.
17. Measles, 100; whooping-cough, 150; cerebro-spinal meningitis, 3. I cannot give the numbers exact; only opinions.
18. Small-pox, cholera, scarlet fever, typhoid fever, diphtheria.
19. No.
21. *January:* Bronchitis, malarial fever, influenza, neuralgia, rheumatism, pneumonia, consumption.
February: Bronchitis, influenza, malarial fever, neuralgia, rheumatism, whooping-cough, consumption.
March: Influenza, bronchitis, neuralgia, rheumatism, malarial fever, whooping-cough, consumption.
April: Intermittent fever, bronchitis, remittent fever, neuralgia, rheumatism, consumption.
May: Malarial fever, bronchitis, neuralgia, rheumatism, consumption.
June: Intermittent fever, neuralgia, rheumatism, consumption, diarrhea.
July: Intermittent fever, remittent fever, cholera infantum, diarrhea, neuralgia rheumatism.
August: Intermittent fever, remittent fever, diarrhea, cholera infantum, consumption.
September: Intermittent fever, remittent fever, cholera infantum, diarrhea, consumption.
October: Intermittent fever, remittent fever, typho-malarial fever, whooping-cough, diarrhea, consumption.
November: Intermittent fever, remitting typho-malarial fever, neuralgia, rheumatism, consumption.
December: Intermittent fever, bronchitis, pneumonia, neuralgia, rheumatism, consumption.
22. I do not know anything definite about horse diseases, except that there was no contagious disease. Some hog cholera.
24. No.
25. I have never heard of any.
26. Very little mentioned.
27. Above the average in quality, but below in quantity owing to the dry season.
28. No.
29. Yes.
30 and 31. Less.
33. July, August, September, June, May, April, October, March, February, January, December, November.
34. July, August, June, May, April.
35. None.
39. None.
40. All the year.
43. Some isolated cases in vicinity of Niles, not traceable to any cause.

Very respectfully, IRWIN SIMPSON.
Niles, Berrien Co., Mich., Jan. 31, 1882.

REPLIES BY MILTON CHASE, M. D., OF OTSEGO, MICH.

1.† 1,000.
2. Eleven, according to record.
3. Town and village of Otsego, south part of Watson, east part of Trowbridge, west of Alamo, and a little of Pine Grove.
4. Increased from one-eighth to one-quarter.
5. I should think 10 or 15 per cent greater.
6. Bilious remittent fevers and pneumonia.
7. I think the long, dry, hot summer and autumn increased the fevers.
8. We had no epidemic in 1881.
9. Have no theory for this.
10. Bilious fevers and pneumonia.
11. We had unusual weather during the whole year, and to the people it was like moving north or south and becoming acclimated.
12. Can't name any.
14. Pneumonia in March and April, and bilious fevers in September and October.
16. Jaundice in September and October, dysentery in September and October.
17. Typhoid fever, about 6; measles, 20; whooping-cough, a few cases; diphtheria, a few cases reported, but I doubt this being correct.
18. Small-pox, cholera, scarlet fever, cerebro-spinal meningitis.
19 and 20. No.
21. *January:* Influenza, bronchitis, neuralgia, intermittent fever, rheumatism, pneumonia, consumption, tonsilitis.
February: Influenza, bronchitis, neuralgia, consumption, rheumatism, intermittent fever, enteritis, diarrhea.
March: Influenza, bronchitis, neuralgia, diarrhea, rheumatism, intermittent fever, consumption, erysipelas, pneumonia, tonsilitis.
April: Influenza, bronchitis, intermittent fever, neuralgia, rheumatism, consumption, erysipelas, diarrhea, diphtheria (doubtful).
May: Influenza, bronchitis, measles, neuralgia, intermittent fever, rheumatism, pneumonia, consumption.
June: Intermittent fever, measles, neuralgia, chicken-pox, rheumatism, consumption, erysipelas, pneumonia.
July: Intermittent fever, diarrhea, neuralgia, rheumatism, cholera morbus, consumption, remittent fever.
August: Diarrhea, dysentery, intermittent fever, cholera morbus, rheumatism, consumption, neuralgia, measles, diphtheria (doubtful).
September: Diarrhea, intermittent fever, neuralgia, rheumatism, cholera morbus, consumption, enteritis, dysentery, typho-malarial fever, diphtheria (doubtful).
October: Intermittent fever, diarrhea, neuralgia, rheumatism, consumption, enteritis, erysipelas.
November: Influenza, neuralgia, intermittent fever, rheumatism, consumption, bronchitis, jaundice, conjunctivitis, erysipelas, diarrhea.
December: Neuralgia, rheumatism, influenza, bronchitis, intermittent fever, consumption, conjunctivitis, pneumonia, jaundice, tonsilitis, typho-malarial fever.
22. No epidemic among animals; a very few more had pneumonia last Spring than usual.
23. No.
24 and 25. None.
26. None to exceed usual amount.
27. All good, but nearly all less in quantity.
28. I think not.
29. Yes.
30. Less.
31. No more.
37. Village about 18 feet.
43. Very doubtful about any cases of diphtheria; in my opinion none have occurred.

Very respectfully, MILTON CHASE, M. D.
Otsego, Allegan Co., Mich., Jan. 24, 1882.

REPLIES BY C. P. WELLS, M. D., OF POKAGON, MICH.

1.† Unincorporated village, 300.
2. Two.
3. Pokagon village and the vicinity, embracing a circuit of from 3 to 5 miles.
4. One-tenth increase.
6. Typho malarial fever and influenza.
8. Diphtheria, scarlet fever, and measles.
9. No exposure to the contagion or infection.
10. None.
15. Typho-malarial fever commenced second week of September, continued through October and November, abating in December.
16 Typhoid fever.
17. Typhoid fever, 8; whooping-cough, a large number, and in several school districts,—probably 50 cases, but few reported.
18. Small-pox, cholera, scarlet fever, measles, cerebro-spinal meningitis, diphtheria.
19. Yes,—whooping-cough.
20. Yes,—no whooping-cough subsequent to fall vacations.
21. *January:* Influenza, quinsy, croup, neuralgia, erysipelas, acute rheumatism.
February: Influenza, bronchitis, croup, neuralgia, quinsy, acute rheumatism, ophthalmia.
March: Influenza, catarrhal-fever, lobular pneumonia, acute rheumatism, neuralgia, croup, hepatitis, pericarditis, peritonitis.
April: Intermittent fever, pneumonia, ophthalmia, neuralgia, enteritis, remittent fever, typhoid fever.
May: Intermittent fever, remittent fever, whooping-cough, typhoid fever.
June: Intermittent fever, remittent fever, diarrhea.
July: Intermittent fever, remittent fever, diarrhea, cholera morbus, paralysis.
August: Intermittent fever, diarrhea, remittent fever, cholera morbus, cholera infantum, enteritis.
September: Typho-malarial fever, intermittent fever, remittent fever, diarrhea, cholera morbus.
October: Typho-malarial fever, diarrhea, intermittent fever, remittent fever.
November: Intermittent fever, typho-malarial fever, rheumatism, bronchitis, erysipelas.
December: Bronchitis, pneumonia, neuralgia, intermittent fever, jaundice.
22. Pink-eye in Dec.,—limited. Have not seen any of the cases of pink-eye. Hog cholera not as prevalent as formerly.
23. No.
24 and 25. Do not.
26. None.
27. Prime.
28. No.
29. Yes.
30 and 31. Less.
34. July, August, and first part of September.
35. From Sept. 10th to the close of the year.
37. 15 to 20 in valleys, 30 to 40 on uplands.
40. July, August, and September (fore part).
41. TYPHOID FEVER.—The first case of typhoid fever appeared on the 29th of April, in the vicinity of Dowagiac Creek, about 2½ miles from this village, and was marked from its inception by a uniform high temperature, with constant delirium after the first week, early appearance of the characteristic rash, and enteric lesion, followed by copious hemorrhage of the bowels on the 18th day, and resulted in death on the 24th day of the illness Every member of the family, in all eight persons, except the youngest, a lad of

† The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 282-305 of this Report. A summary of the replies is printed on pages 283-305.

about five years of age, who seemed to be wholly unaffected by it, was attacked by the fever. Some of the cases were quite severe, while others, especially the younger members of the family, very light. The enteric lesion was very pronounced, even in the mildest case, all suffering more or less from tympanitis and hemorrhage from the bowels at some stage of the disease. The patients were separated as much as possible, some were removed to a separate building, adjacent to the family residence, and the entire premises were kept as cleanly as possible, and special attention given to the thorough and presistent use of disinfectants during the prevalence of the disease. No further mortality occurred, and the disease did not extend beyond the members of this family. The source of infection in the first case has not been very well ascertained. The water supply is derived partly from a large spring, a few rods from the dwelling, and partly from a drive well near the house. The water has not been submitted to an analysis, but seems to be of the same character as that which supplies Crystal Springs Camp Ground, belonging to the M. E. Church, and formerly used by the Michigan Fish Commission at their hatchery, from which it is distant about one-fourth of a mile. In all respects, the sanitary conditions seemed to be as satisfactory as that of most farm residences. The father of the family, the one first attacked, sustained a large veterinary practice in this vicinity, and was constantly employed among diseased horses in filthy stables; infection from this source has been suggested as among possible causes.

INFLUENZA was very prevalent during the cold months of this year, one-half of the whole population at least having been affected by it; only one death from this cause came under my observation. Nervous troubles, as functional disease of heart, neuralgia, hysteria, &c., seemed to follow as sequels in many cases.

TYPHO-MALARIAL FEVER.—This fever made its appearance in this locality the second week in September, or shortly after the autumn rains commenced; there having been a severe drouth here as elsewhere in the State, lasting nearly all summer, which was especially severe during the months of July, August, and the first week of September. Subsequently, and about the 10th of September, the weather remaining very warm, rain commenced falling and continued with frequent showers until December. The disease was quite severe in many cases, running a course of from three to six weeks; a large number being attacked during the latter part of September and the first weeks of October, and it did not entirely disappear until December.

A difference of opinion exists among physicians here as to the type of this fever. In most cases the enteric lesion was quite pronounced, while in others it seemed to be almost entirely absent. The range of temperature in most of the cases was high, 104° to 106° morning and evening, with active delirium for the first 9 or 10 days, then dropping abruptly to 99° morning, and 100° to 102° evening temperature; raising again to 103° to 105° after the 18th day, gradually falling to the normal temperature from the 21st to the 30th day in favorable cases.

In several cases rash appeared on the 21st day, very closely resembling the eruption of typhus fever. There was no hemorrhage from the bowels in any case that came to my knowledge although nose-bleed was of very frequent occurrence.

It is a fact worthy of notice, that all cases of this fever that came to my knowledge, occurred in families residing on bottom lands, near streams, where the wells were shallow, from 12 to 20 feet deep, no case occurring on up lands, where the ground water was 30 feet or over below the surface of the soil.

42 and 43. Did not prevail.

Very respectfully,
CHARLES P. WELLS.

Pokagon, Cass Co., Mich., Dec. 31, 1881.

REPLIES BY ROBERT F. STRATTON, M. D., OF ST. JOSEPH, MICH.

1.† Village, 2,700.
2. Thirty-three.
3. Village of St. Joseph.
4. Twenty per cent increase (estimated).
5. Increased about 20 per cent (estimated).
6. Remittent fever—including under this head all diseases of children not bowel complaints.
7. The unusually hot summer weather.
8. Intermittent fever.
9. To the more general cultivation of the soil, better drainage, better houses, deeper wells.
10. Remittent fever, old age.
11. More old people to die.
12. Scarlet fever, diphtheria, consumption.
13. Absence of contagion in first two, and the mild and humid air in case of consumption.
14. In August, infantile diseases, such as fits, brain affections, and fever—all called remittent fever.
17. Measles, 15; whooping-cough, 25; diphtheria, 1.
18. Small-pox, cholera, scarlet fever, typhoid fever, cerebro-spinal meningitis.
19 and 20. No.
21. *January:* Bronchitis, rheumatism, consumption, remittent fever.
  February: Bronchitis, intermittent fever, remittent fever, rheumatism, consumption.
  March: Bronchitis, diphtheria, consumption.
  April: Bronchitis, tonsilitis, intermittent fever, remittent fever, consumption.
  May: Intermittent fever, remittent fever, measles.
  June: Intermittent fever, remittent fever, measles, whooping-cough, consumption.
  July: Intermittent fever, cholera infantum, cholera morbus, diarrhea, dysentery.
  August: Cholera infantum, cholera morbus, diarrhea, dysentery, intermittent and remittent fevers, measles, whooping-cough.
  September: Remittent fever, intermittent fever, diarrhea, dysentery.
  October: Intermittent and remittent fevers, typho-malarial fever, diarrhea, tonsilitis.
  November: Intermittent, remittent, and typho-malarial fevers, tonsilitis, consumption.
  December: Tonsilitis, remittent fever, rheumatism, consumption.
26. Some rot in potatoes, and much mold in corn fodder.
27. In good condition.
29. Yes.
30 and 31. Less.
32. *January:* Cold, snow, dry air.
  February: Cold, snow, dry air.
  March: Cool.
  April: Cool.
  May: Mild.
  June: Cool.
  July: Hot, humid, rainy.
  August: Very hot; ground very dry.
  September: Rainy, hot, humid air.
  October: Cool; ground very wet.
  November: Cold; very much rain.
  December: Very wet and very warm.
33. Aug., Jan., Mar., Apr., May, June, July, Sept., Oct., Nov., Dec.
34. Aug., Jan.
35. Sept., Oct., Nov., Dec.
36. Jan. and Feb., 12; March, 10; April, 9; May, 10; June and July, 11; Aug., 12; Sept., 10; Oct., 9; Nov., 8; Dec., 7.
37 and 38. Two to 15 feet.
39. Dec., Nov., Oct., July.
40. Aug., Jan.
41. The hot weather in Aug. caused much sickness among infants.
43. Introduction unknown.

Very respectfully,
ROBERT F. STRATTON.

St. Joseph, Berrien Co., Jan. 24, 1882.

SOUTHERN-CENTRAL DIVISION OF THE STATE.*

REPLIES BY H. J. HALE, M. D., OF GRASS LAKE, MICH.

1.† Village 700, township 1,800.
3. Village, township, and southern part of Waterloo, western part of Sharon, southwest part of Leoni.
6. Diphtheria, measles, typhoid fever, cerebro-spinal meningitis.
7. Diphtheria, from contagion.
8. Less malarial trouble.
9. Removing standing water on low lands by drain tile.
10. Diphtheria, cerebro-spinal paralysis.
11. Malignant diphtheria.
12. None.
14. Diphtheria—Dec., Jan., Feb., March, April, Nov.
15. Measles.
16. Cerebro spinal meningitis; dates not known.
17. Scarlet fever, 3; typhoid fever, 2; measles, numberless; whooping-cough, 2; cerebro-spinal meningitis, 1; diphtheria, 19. I speak from my yearly report; cannot obtain any other at present.
18. Small-pox, cholera.
19. I don't think it has. In Shank's district, where I had the largest number of cases, the school was closed and the disease confined to Shank's and Easterleys.
20. I have not.
21. *January:* Diphtheria, 8.
February: Diphtheria, 1; scarlet fever, 3.
March: Diphtheria, 1.
April: Whooping-cough, 3.
November: Diphtheria, 6.
22. A few cases of epizooty. No disease among hogs.
23 and 24. No.
25. I know of none.
26. No disease. Cereals and grasses in healthy condition.
27. Good.
28. No.
29. Yes.
30 and 31. Not at all.
42 and 43. Contagion.

Very respectfully, H. J. HALE, M. D.
Grass Lake, Jackson Co., Jan. 24, 1882.

REPLIES BY JOHN W. FALLEY, M. D., OF HILLSDALE, MICH.

1.† About 4,000.
2. Forty-eight. Several came home to die.
3. City of Hillsdale.
4. Slightly fewer cases.
5. About the same.
6. Catarrhal fevers and consumption. Most consumptives were from abroad.
7. None, except the winter and spring (early) very cold, with catarrhal fever.
8. Very few deaths from fevers of any kind.
9. Less water-fall in the hot weather.
10. Catarrhal fevers.
12. Perhaps fevers. Only five.
13. The streets and all parts of the city clean, and good pure water used.
14. None.
15. Mortality low in all cases.
16. None. Our sickness has been light in quantity and mild in quality as a rule. Most of our deaths from consumption came here from abroad.
17. Whooping-cough, 50; perhaps more. It was mostly light and mild I did report diphtheria once or twice, but am satisfied it was only cynanche. One doctor had all the cases, 8 or 10. Other doctors had sore throats.
18. None occurred, except whooping-cough.
19. No.
20. To stop whooping-cough, we kept all infected families away.
21. *January:* Influenza, neuralgia, rheumatism, erysipelas, intermittent fever, pneumonia.
February: The same as January, with a little croup.
March: The same, with addition of catarrh.
April: Catarrhal fevers, remittent fever, pneumonia, catarrh, neuralgia, influenza, rheumatism, intermittent fever.
May: Catarrhal fever (some bad), influenza, neuralgia, rheumatism, erysipelas, croup (one case).
June: Intermittent fever, remittent fever, catarrhal fever (first), erysipelas, neuralgia, rheumatism, diarrhea, etc. Catarrhal fever died out suddenly in June.
July: Intermittent fever, remittent fever, diarrhea, erysipelas, cholera morbus.
August: Intermittent, remittent, bilious, and continued fevers, diarrhea, rheumatism, erysipelas, cholera morbus, neuralgia.
September and October: Diarrhea, intermittent, remittent, and continued fevers, rheumatism, erysipelas, neuralgia, typho-malarial fever, whooping-cough, cholera morbus.
November: Intermittent and remittent fevers, neuralgia, whooping-cough, pneumonia, consumption, bronchitis.
December: Intermittent and remittent fevers, erysipelas, rheumatism, neuralgia, whooping-cough, consumption, pneumonia.
22. Animals have been remarkably free of all diseases.
23. I reported one case of a flock of hens last year.
24. No.
25. No.
26. Not any.
27. Some wheat damp from rains.
28. No.
29. Much was damp. By great care, little damage.
31. Not badly.
36. Jan. and Feb., lowest, April, highest. Aug. and Sept., lowest. Most of our wells are 35 to 70 feet deep, and little affected by rains.
37. On the flats of St. Jo. 12 to 15 feet. Away from the flats, 30 to 60 feet.
39. Oct. and Nov.; very rainy.
40. August and Sept. But water was not very low last year.
41. I have none this year, as we have had very little such diseases.
42. Did not.
43. We had some cynanche trachealis, but only one Dutch doctor has had diphtheria.
44. One fact you will notice in my weekly reports. Rheumatism and erysipelas have been about the same, and at all times of the year.

Very respectfully, JOHN W. FALLEY.
Hillsdale, Hillsdale Co., Feb. 17, 1882.

REPLIES BY WM. WORSFOLD, M. D., OF JACKSON, MICH.

1.† 17,000.
2. Interments in general cemetery 226 in 1881 to 155 in 1880. The number in Roman Catholic cemetery I was unable to get, but I believe it is included in report of chairman board of health of city.
3. City corporation limits.
4. It was probably twice that of 1880.
5. Greater.
6. Cerebro-spinal meningitis, cholera morbus, cholera infantum. There was more than usual malarial fever, more especially intermittent, without mortality. This is true of diarrhea.

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*For counties included in each division, see Exhibit 1, page 287.
† The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 282–305 of this Report. A summary of the replies is printed on pages 283–305.

7.† The prolonged severity of winter I think had something to do with the causation of cerebro-spinal meningitis. The high temperature of summer, with lack of rain, certainly caused the others.

8. We had less remittent and less lung troubles in the spring and early summer months.

10. The three above mentioned diseases.

11. They were more severe in type, and probably the continued low temperature of the previous winter had rendered the vital endurance less.

14. Cerebro-spinal meningitis from 20th March to about 30th June; cholera morbus 15th June to 1st Sept.; cholera infantum about same.

16. Cerebro-spinal meningitis about 20th March to 1st July.

18. Small-pox and Asiatic cholera.

19. It has contributed to spread of diphtheria.

20. Have had to close but one or two of schools for short time on account of diphtheria in their locality; I believe it was followed by a beneficial result.

21. *March:* Acute catarrh, bronchitis, pul. consumption, pneumonia, rheumatism, laryngitis s., tonsilitis, neuralgia, intermittent fever, diphtheria, cerebro-spinal meningitis, scarlatina, whooping-cough.

April: Acute catarrh, bronchitis, pul. consumption, pneumonia, cerebro-spinal meningitis, neuralgia, rheumatism, tonsilitis, laryngitis s., intermittent fever, diphtheria, scarlatina, measles.

May: Acute catarrh, bronchitis, pul. consumption, intermittent fever, cerebro-spinal meningitis, pneumonia, measles, rheumatism, laryngitis s., diphtheria, scarlatina, remittent fever.

June: Intermittent fever, acute catarrh, measles, cerebro-spinal meningitis, pul. consumption, diarrhea, cholera morbus, bronchitis, cholera infantum, remittent fever, rheumatism, diphtheria, laryngitis, peritonitis.

July: Diarrhea, intermittent fever, cholera morbus, cholera infantum, cerebro-spinal meningitis, p. consumption, remittent fever, measles, peritonitis, enteritis, diphtheria, pertussis.

August: Diarrhea, intermittent fever, remittent fever, cholera morbus, cholera infantum, p. consumption, cerebro-spinal meningitis, peritonitis, enteritis, typho-malarial fever, dysentery, measles, diphtheria.

September: Intermittent fever, remittent fever, diarrhea, p. consumption, typho-malarial fever, acute catarrh, bronchitis, cholera morbus, cholera infantum, cerebro-spinal meningitis, peritonitis, enteritis, pertussis, rheumatism.

October: Intermittent fever, typho-malarial fever, acute catarrh, bronchitis, remittent fever, consumption, pertussis, diphtheria, rheumatism, diarrhea, laryngitis s.

November: Acute catarrh, bronchitis, p. consumption, typho-malarial fever, rheumatism, pertussis, diphtheria, laryngitis s., intermittent fever, p. congestion and pneumonia, neuralgia, remittent fever, tonsilitis, peritonitis.

December: Acute catarrh, bronchitis, p. consumption, p. congestion and pneumonia, neuralgia, rheumatism, diphtheria, tonsilitis, pertussis, peritonitis, typhoid fever, remittent fever.

22. There were a number of deaths of horses in February and March from what seemed to be a cerebro-spinal trouble.

26. Heard nothing of any of these.

27. In good condition.

28. Do not think so.

29. Yes.

30. Heard of none.

31. Was in good condition.

43. It is now a general disease with us, occurring during every month in year, from latent germs probably, and in all parts of city.

Very respectfully, WM. WORSFOLD.

Jackson, Jackson Co., March 26, 1882.

REPLIES BY A. A. DUNTON, JR., M. D., OF JEROME, MICH.

3.† Somerset and Moscow townships.

4. About an average.

5. The average.

6. More old and broken-down persons; no special disease. We have had our share of scarlet fever, measles, and whooping-cough, etc.

12. Fevers, though the surrounding towns had their full share, and ours, too; cannot say why.

15. There was not a death from scarlet fever.

16. I met one curious case of degeneration of heart and arteries; cannot state form of degeneration; no post-mortem allowed. It was hereditary, as father and brother died similarly, and of four sisters three have heart-lesions. Diagnosis confirmed by Dr. A. F. Whelan.

17. Scarlet fever, a great many—20 or more; typhoid fever, none with us, though the town south had a large number—I should say 6 or 7; measles, a large number; whooping-cough, many.

18. Small-pox, cholera, typhoid fever, cerebro-spinal meningitis.

19. Yes; measles and scarlet fever.

22. A disease among hogs. No two hogs acted alike; some affected in hinder parts, some forward parts, some spinal region, etc.

23. Did not see anything of it in other animals.

24. Do not, but have seen hogs killed and eaten that could not stand alone with this disease.

26. Rot with potatoes.

27. Quite wet.

29. No.

30. Yes.

31. More.

34. All the fall, till quite late.

37. Right about here, 6 or 7 feet; north of here, quite deep.

42. I was not here at the time of its entrance.

Very respectfully, A. A. DUNTON.

Jerome, Hillsdale Co., Mich., May 13, 1882.

REPLIES BY W. B. SOUTHARD, M. D., KALAMAZOO, MICH.

1.† 14,000.

2. 311.

3. Kalamazoo village and township.

4. I should say one-fourth greater.

5. I should say 25 per cent greater.

6. Diphtheria and typho-malarial fever.

7. Most of the cases of diphtheria occurring in October and November were among children in attendance upon the Woodard Avenue School, or taken from such children. The school is supplied with Holly water, but it is conveyed by a four-inch end-pipe, and no one taking water from it but the school. This pipe from where it leaves the main is some 40 rods long, and there is no circuit. The janitor, as I have been informed, would draw two or three pailfuls and then draw for the school. The scholars had so complained of the water that some parents directed their children not to use it. We had, during the year 1881, 52 deaths from diphtheria and 275 from all causes. The majority of cases of typho-malarial fever occurred among those living in portions of the town where shallow wells are used, which receive a large amount of surface-water; 20 cases occurred in a space of about two blocks (5 fatal), where all the water used was of this kind.

8. Bowel complaints, such as dysentery, diarrhea, cholera morbus, etc.

9. To the summer drouth occurring later in the season.

10. Diphtheria and typho-malarial fever.

11. See reply to question 7.

12. Bowel complaints.

13.† The dry spell later in the season.
14. In April and November from diphtheria, and September and October from typho malarial fever.
15. In May and June, but few deaths from all causes.
16. Small-pox, in December.
17. Small-pox, 2.
18. Cholera and cerebro-spinal meningitis.
19. See reply to questions 7 and 11.
20. I have not.
21. *January:* Intermittent fever, influenza, bronchitis, remittent fever, tonsilitis, neuralgia, pneumonia, diphtheria.
February: Intermittent fever, influenza, bronchitis, tonsilitis, remittent fever, neuralgia, pneumonia, diphtheria, scarlatina.
March: Intermittent fever, influenza, bronchitis, tonsilitis, measles, diphtheria, pneumonia, remittent fever, neuralgia.
April: Intermittent fever, measles, diphtheria, remittent fever, tonsilitis, rheumatism, influenza, neuralgia, consumption.
May: Intermittent fever, measles, remittent fever, diphtheria, rheumatism tonsilitis, consumption.
June: Measles, intermittent fever, remittent fever, diphtheria, rheumatism, cholera morbus.
July: Measles, intermittent fever, diarrhea, cholera morbus, remittent fever. cholera infantum.
August: Diarrhea, intermittent fever, cholera infantum, cholera morbus, remittent fever, dysentery, diphtheria, whooping-cough.
September: Diarrhea, intermittent fever, remittent fever, typho-malarial fever, cholera infantum, cholera morbus, dysentery, diphtheria.
October: Intermittent fever, remittent fever, typho-malarial fever, diphtheria, consumption.
November: Diphtheria, intermittent fever, typho-malarial fever, tonsilitis, neuralgia, consumption.
December: Intermittent fever, influenza, remittent fever, tonsilitis, typho-malarial fever, bronchitis, diphtheria, pneumonia.
22. In August and September hog cholera was quite prevalent and fatal; in many instances they had access to stagnant water and no other.
23. It was not.
24 and 25. I do not.
27. Good.
28. Not aware of any.
29. Yes.
30. Less.
31. More.
34. August and September.
35. June, July, and November.
37. On table lands, 80 to 100 feet; valley plains, 20 feet; bottoms, 6 to 12 feet.
39. June and November.
40. August and September.
41. A family living in the country had scarlet fever. They were directed to thoroughly cleanse the house and everything used about the sick. How well it was done I am not able to say; but two months afterwards a niece came to visit them, staying all night and sleeping in the same room where the sick had been. The next night she visited another uncle one mile distant, and slept with his daughter. A week from that time both the girls came down with scarlet fever; the last mentioned girl had not been away from home.

Very respectfully,
W. B. SOUTHARD.
Kalamazoo, Kalamazoo Co., March 13, 1882.

REPLIES BY W. L. WORCESTER, M. D., OF MICH. ASYLUM FOR INSANE, KALAMAZOO.

1.† The average number of patients during the year was about 690. There were usually from 100 to 170 persons employed in various capacities.
2. Fifty-eight, among patients exclusively.
4. Greater, by probably about 100 per cent.
5. Greater, by about 40 per cent.
6. Diphtheria, pharyngitis, and tonsilitis, dysentery, pneumonia, pulmonary consumption.
7. The Asylum has been overcrowded during the year. I know of no other cause for the unusual prevalence of any of the above diseases.
10. Diphtheria, dysentery, pneumonia, pulmonary consumption.
11. Increased prevalence. The proportion of deaths to cases was not remarkably high.
14. From the last week in July to the first week in September, bowel complaints, assuming in the severer cases a well-marked dysenteric character, were quite prevalent, and proved fatal to five women and one man, all of whom were previously in a feeble condition. The commencement and cessation of the epidemic were both quite sudden, and without any obvious cause, either in diet, atmospheric conditions, or the sanitary state of the buildings.
Diphtheria was epidemic during the first *five* months of the year, and an isolated fatal case occurred in August. There were fifty-eight cases, of which four proved fatal, and two died from remote effects.
Pneumonia in February and March, November and December.
16. Diphtheria, as above.
17 and 18. None of the diseases mentioned except diphtheria.
21. There were several cases of erysipelas in March, and a number of cases of mild malarial fevers in October and November. Those, with the diseases already mentioned, were the only ones specially prevalent at any time during the year.
22. From about the middle of September to the middle of November there was an epidemic among the swine belonging to the asylum, in which 27 died. I was not informed of it until it had ceased, and do not know its precise nature. I was told that the attacks commenced with diarrhea and vomiting, and that the lungs of two animals which were opened were found diseased. It was quite rapidly fatal.
24. I know of none.
33. Soil unusually dry in August and September.
36 and 37. Water stands about 17 feet deep in asylum well, at a depth of about 100 feet below the buildings. Does not vary with years or seasons.
42. No scarlet fever here.
I should, perhaps, say a word in regard to the indefiniteness of some of my answers, which might, perhaps, be supposed to indicate carelessness in keeping our records. Full notes are kept of every case received here, and any intercurrent disorder is recorded with the other notes of the case. To search through all the notes of the 900 to 1,000 cases treated during the year would involve more labor than I am able to give to the work.

Respectfully,
W. L. WORCESTER.
Kalamazoo, Kalamazoo Co., Mich.

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† The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 282-303 of this Report. A summary of the replies is printed on pages 283-305.

REPLIES BY ASHER C. TAYLOR, M. D., OF MANCHESTER, MICH.

1.† One thousand, one hundred and fifty.
2. Sixteen.
3. Manchester village, and a radius of six miles, average, in all directions.
4. Probably somewhat greater. Only slightly so.
5. More than double that of last year.
6. Principally pulmonary affections.
7. Extreme cold without change during winter caused pulmonary disease, and prolonged steady heat and drouth in summer caused cholera morbus and infantum.
8. None that I am aware of.
10. Pneumonia, cholera morbus, cholera infantum, and membranous croup.
11. I believe extremes of temperature continued longer than usual without change.
12. None.
14. Probably none, except cholera morbus. There were simply more cases of some diseases, but not a higher rate of mortality.
15. None.
16. 1st. A form of entero-colitis, or "winter cholera," prevailed to some extent in January, I believe. 2d. Rotheln, or "rubeola," which I never saw before this year.
17. Cerebro-spinal meningitis, 2; diphtheria, 2. Besides these, there were some cases *complicated* by meningitis.
18. Small-pox, cholera, typhoid fever, scarlet fever, measles, whooping-cough.
19 and 20. No.
21. *January:* Pneumonitis, bronchitis (diffuse or capillary), entro-colitis.
February: Pneumonitis, bronchitis, rheumatism.
March: Pneumonitis, bronchitis, rheumatism, neuralgia.
April: Remitting fever 1, pneumonia 2, bronchitis 3, intermittent fever 4, rheumatism 5, consumption 6, (tonsilitis, rotheln, whooping-cough, erysipelas), 7.
May: Remittent and intermittent fever 1, pneumonitis 2, rotheln 3, bronchitis 4, cholera morbus, cholera infantum, neuralgia, whooping-cough.
June: Rotheln, intermittent fever, remittent fever, neuralgia, cholera morbus, cholera infantum.
July: Intermittent, remittent, diarrhea, cholera morbus (neuralgia, cholera infantum), pneumonia, membranous croup, tonsilitis.
August: Intermittent fever 1, (diarrhea, remittent fever), 2, cholera morbus, cholera infantum, tonsilitis, membranous croup, scarlatina.
September: Cholera infantum, intermittent and remitting fever, cholera morbus, diarrhea, tonsilitis.
October: Sick myself, and did not make observations.
November: Intermitting and remitting fever, influenza, tonsilitis, rheumatism, diarrhea.
December: Influenza, remitting fever, intermitting fever, bronchitis, rheumatism.
22. In November we had a few cases of broncho-nasal catarrh in horses; nothing more.
23. No.
26. None.
27. Corn and buckwheat was damp and mildewed. Other grains in good condition.
28. I believe not.
29. Yes.
30. Very little.
31. No.
32. *January, February, and March:* Continuously cold.
April: Cold and wet.
May: Nothing unusual, except very dry for last half.
July and August: Very hot and dry; water level low.
September: Still dry, and very hot.
October: Latter part more rain.
November: Very wet and warm.
December: Very heavy rainfall.
33. Sept., May, July and August, April, Nov., Dec.
34. May and Sept.
35. Nov. and Dec.
37. The surface is so irregular in form and composition, that it cannot be done in a brief report.
39. Dec., Jan., April.
40. May, Sept., August, July.
42. The facts are unknown. It has probably existed in different localities in this vicinity for 3 or 4 years.
43. Cannot be definitely ascertained, but is said to have existed in neighboring towns for some time.

Very respectfully,
ASHER C. TAYLOR.
Manchester, Washtenaw Co., Jan. 11, 1882.

REPLIES BY HORACE C. CLAPP, M. D., OF MENDON, MICH.

1.† About 1,000.
2. Ten.
3. Radius of six miles.
4. Same as the average.
5. About one-half per cent greater.
6. Congestive.
8. None.
10. Congestive.
12. None.
14. Cerebro-spinal meningitis, Aug. 30, Sept. 29, Oct. 5, Oct. 23; malignant intermittent, Sept. 26, Oct. 1; typhoid fever, Oct. 6, Nov. 10; congestion brain, Oct. 6.
15. Diphtheria, March 24, 3 cases; April 23, 2 cases; May 7, 5 cases; June 22, 1 case; July 9, 2 cases; July 23, 2 cases,—none died.
16. Cerebro-spinal meningitis, Aug. 30, Sept. 29, Oct. 5 and 22; malignant intermittent, Sept. 26 and Oct. 1; typhoid and typho-malarial fevers in one locality, all through October.
17. Scarlet fever, 2; typhoid fever, 5; measles, 50+; cerebro-spinal meningitis, 4; diphtheria 15.
18. Small-pox, cholera, whooping-cough.
19. Yes.—diphtheria,—14 cases in one school district.
20. No.
21. *January:* Intermittent and remittent fevers, neuralgia, bronchitis, erysipelas, consumption, pneumonia, tonsilitis, measles, croup, diphtheria.
February: Influenza, measles, bronchitis' neuralgia, tonsilitis, intermittent and remittent fevers, pneumonia, diarrhea. cholera morbus, consumption, rheumatism.
March: Influenza, measles, neuralgia, tonsilitis intermittent and remittent fever, bronchitis, erysipelas, rheumatism, consumption, diphtheria, puerperal convulsions.
April: Measles, influenza, tonsilitis, neuralgia, intermittent and remittent fever, bronchitis, consumption, rheumatism, erysipelas, diphtheria.
May: Measles, intermittent and remittent fever, bronchitis, neuralgia, rheumatism, consumption, tonsilitis, diphtheria, pneumonia.
June: Intermittent and remittent fever, bronchitis, neuralgia, measles, rheumatism, influenza, consumption, diphtheria.
July: Intermittent and remittent fever, cholera morbus, bronchitis, diarrhea, consumption, rheumatism, diphtheria.
August: Diarrhea, cholera morbus, dysentery, intermittent and remittent fever, bronchitis, neuralgia, rheumatism, consumption.
September: Intermittent and remittent fever, diarrhea, cholera morbus, dysentery,

bronchitis, neuralgia, rheumatism, consumption, typho-malarial fever.
October: Intermittent and remittent fever, bronchitis, consumption, typho-malarial fever, cerebro-spinal miningitis, neuralgia.
November: Typho-malarial fever, intermittent and remittent fever, bronchitis, neuralgia, consumption, erysipelas.
December: Intermittent and remittent fever, typho-malarial fever, bronchitis, consumption, neuralgia, scarlet fever, rheumatism, tonsilitis.

22. No special disease has prevailed among hogs or other animals, but might not the increased malignancy of diseases of 1881 be attributable to the diseased pork raised the year before, as "hog cholera" was very prevalent here in the fall of 1880, continuing nearly all the winter of 1880 and '81, most of them dying off.

23. Was in 1880, man alone being a *doubtful* exception.

24. None but presumptive or possible effects as stated in 22.

26. None of any account.

27. Usually good.

28. No. The army worm nearly destroyed many pieces of oats.

29. Yes.

30. Usual proportion.

31. No.

32. *January:* Cold and dry; streams low.
February: Wet the fore part, with overflowing streams; latter part cold and snow.
March: Overflowing streams, ground covered with snow.
April: Streams remain filled, wet and snow; latter part little dryer.
May: Dry; latter part quite dry.
June: Wetter; streams again high.
July: Dry all through and hot.
August: Very dry the entire month.
September: Fore part dry, the latter some rain.
October: Quite wet.
November: Very wet all the month.
December: Very wet, latter part a little dryer.

33. August, July, May, September, January, June, February, March, April, October, November, December.

34. August, July, and January.

35. October, November, December, and February.

37. From 15 to 18 feet.

39. October, November, December and February.

40. July, August and fore part of September.

41. No data, but diseases have *seemed* to have an unusual tendency to malignancy.

42. Could not determine.

43. By personal contact or communication.

Very respectfully,
HORACE C. CLAPP.
Mendon, St. Joseph Co., Mich., Jan. 13, 1882.

REPLIES BY L. G. NORTH, M. D., OF TECUMSEH, MICH.

1.† Village of Tecumseh, 2,400.

2. About fifty.

3. Village and surrounding country within radius of 3 or 4 miles.

4 and 5. About same.

6 and 8. None to any marked extent.

10. Old people seem to have died more than usual.

12. Do not know of any.

14. In village typhoid fever seemed unusually fatal.

15. Dysentery in Aug. and Sept.

17. Scarlet fever, 120; typhoid fever, 20; measles, 40; whooping-cough, 150.

18. Small-pox, cholera, cerebro-spinal meningitis, and diphtheria.

19. Yes; whooping-cough.

20. No.

21. I can only say that the diseases of the year have followed about their usual course. Much lung and throat trouble after about March 1. Jan. and Feb. were healthy months. May, June, and July, little sickness.
August and *September;* Much malarial and bowel trouble, with beginning of typhoid fever in September.
October: Same as August. Several consumptives died, and typhoid severe.
November: Typhoid still severe, with decrease of malarial and bowel affections.
December; Typhoid less, and otherwise same as November.

22. I think there has been nothing of interest under this head. One horse was believed to have glanders and was killed, the veterinary surgeon consulting myself in the matter. I did not see the horse and believe it was not glanders. Other horses were exposed but had no disease.

23. No.

24 and 25. I know of none.

27. Perhaps not quite as good as usual.

28. Not that I know of.

29. Not as much as usual.

30. Rather more.

31. More.

32. *January* and *February;* Very cold.
March: Usual.
April and *May;* Dry.
June; Usual.
July; Wet.
August, September, October, and *November:* About usual.
December: Open.

33. May, April, June, March, Feb., Jan., July, Aug., Nov., Dec., Oct., Sept.

34. April and May.

35. Sept. and Oct.

36. Three feet all the year. Water in gravel, and about same all the year.

37. From 25 to 40 feet. Not great variation.

38. Essentially the same all the year.

39 and 40. In no months.

42. The first cases for 1881 were due to cases belonging to 1880, and in 1880 it was probably imported.

43. No cases.

44. Shut up the saloons.

Very respectfully,
L. G. NORTH.
Tecumseh, Lenawee Co., Jan. 25, 1882.

REPLIES BY C. W. BACKUS, M. D., THREE RIVERS, MICH.

1.† About 3,000.

2. 21.

3. Village of Three Rivers.

4 and 5. About the same.

6. Pneumonia and diphtheria.

7. From the former severe winter, and most cases being old people.

8. Malarial.

9. Drainage of marshes and favorable meteorological changes.

10. Pneumonia and diphtheria.

11. Deaths from the former disease being old people, and the attack being severe.

12. None unless malarial.

13. Same as in No. 9.

14. Diphtheria, February; Pneumonia, January, February, March, April, May, June; remittent fever, October and November.

15. None, or about the same as in former years.

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† The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 282-305 of this Report. A summary of the replies is printed on pages 283-305.

16.† Diphtheria, February; do not have diphtheria much in this village in late years.
17. Scarlet fever, 6; measles (opinion), 100; whooping-cough (opinion), 100; diphtheria, 10; the numbers being cases reported, but should judge about 100 of each, measles and whooping-cough.
18. Small-pox, cholera, typhoid fever, cerebro-spinal meningitis.
19. Yes; measles and whooping-cough.
20. No.
21. *January:* Intermittent fever, bronchitis, influenza, neuralgia.
February: Intermittent fever, remittent fever, bronchitis, pneumonia, neuralgia.
March: Intermittent fever, remittent fever, bronchitis, pneumonia.
April: Intermittent fever, bronchitis, influenza, neuralgia.
May: Measles, intermittent fever, remittent fever, rheumatism, neuralgia.
June: Intermittent fever, remittent fever, bronchitis.
July: Intermittent fever, remittent fever, rheumatism, neuralgia.
August and September: Intermittent fever, remittent fever, diarrhea, cholera morbus.
October: Intermittent fever, remittent fever, influenza, bronchitis.
November: Intermittent fever, remittent fever, bronchitis, neuralgia, influenza.
December: Bronchitis, intermittent fever, remittent fever, neuralgia, rheumatism.
22. Some hog-cholera, scattered, but not much; also chicken-cholera, both diseases having been slightly prevalent for several years.
23. No.
24 and 25. None.
26. Potatoes rotted early in the fall.
27. Healthy.
28. None to my knowledge.
29. Yes; not much to thresh.
30 and 31. No.
41. None.
42. Could discover no cause, unless from infection from cases one year ago, but think all cases may have been sporadic.
43. A nurse from the asylum at Kalamazoo visited a house in which lived two families, and all were taken sick; and it was reported that diphtheria had been prevailing in the Asylum, and that this man nursed those cases prior to his visit here.

Very respectfully,
C. W. BACKUS.
Three Rivers, St. Joseph Co., April 18, 1882.

REPLIES BY R. P. BEEBE, M. D., OF UNION CITY, MICH.

1.† Incorporated village, 1,300.
2. Eighteen; taken from only undertaker in the village.
3. Union City.
4. Greater 1880; increased one-quarter.
5. Increased about one-quarter.
6. Old age.
10. Heart disease.
12. Scarlet fever.
14. None.
15. Scarlet fever.
16. Varioloid.
17. Small-pox, 1; scarlet fever, 8; typhoid fever, 2; measles, 4; diphtheria, 2.
18. Cholera, whooping-cough, cerebro-spinal meningitis.
19. No.
21. I have no record of first three months.
April: Intermittent fever, bronchitis, remittent fever, pneumonia, scarlatina, neuralgia, tonsilitis, rheumatism, measles.
May: Intermittent fever, remittent fever, scarlatina, neuralgia, bronchitis, rheumatism.
June: Intermittent fever, remittent fever, neuralgia, rheumatism, tonsilitis, typho-malarial fever, diarrhea.
July: Intermittent fever, remittent fever, diarrhea, cholera morbus, neuralgia, bronchitis, rheumatism, cholera infantum.
August: Intermittent fever, diarrhea, cholera morbus, remittent fever, bronchitis, cholera infantum, neuralgia, rheumatism, dysentery, scarlatina.
September: Diarrhea, cholera morbus, intermittent fever, remittent fever, bronchitis, dysentery, neuralgia, rheumatism, tonsilitis, diphtheria, pul. consumption.
October: Intermittent fever, diarrhea, remittent fever, neuralgia, bronchitis, rheumatism, cholera morbus, tonsilitis, pul. consumption.
November: Intermittent fever, remittent fever, neuralgia, rheumatism, bronchitis, diarrhea, cholera morbus, cholera infantum, typhoid fever (ent.).
December: Intermittent fever, bronchitis, remittent fever, neuralgia, rheumatism, diarrhea, tonsilitis, scarlatina, pneumonia, typhoid fever (enteric), varioloid.
22, 23, 24, and 25. None.
26. Slight rust in wheat and oats; smut in corn. Apples rotted and dropped prematurely.
27. Wheat in good condition. Corn grown and in poor condition.
28. Smut in corn more than usual.
29. It was.
30. Usual proportion.
31. More.
33. August, July, Sept., June, Oct., April, May, Jan., Feb., March, Nov., Dec.
34. August, July, Sept.
35. Nov. and Dec.
37. 35 to 40 on north side of river; on south side 12 to 16 feet.
39. Nov. and Dec.
40. Aug., July, and Sept.
42. Imported.
43. I think it was caused by filth; only one family were attacked.

Very respectfully,
R. P. BEEBE, M. D.
Union City, Branch Co., Jan, 17, 1882.

REPLIES BY EDWARD H. HURD, M. D., OF UNION CITY, MICH.

1.† Union City. About 1,500.
2. Twenty-one or twenty-two.
3. About five miles each way from the village.
4. About the same.
5. Probably one-sixth or one-fifth less.
6. Do not know that any diseases were prevalent during 1881.
8. Diseases dependent upon malarial and upon zymotic causes, (e. g.) typhoid fever and typho-malarial.
9. Better hygiene, better drainage, better care of cellars, better ventilation, and better care of individuals.
10. Do not know of any.
12. From typhoid fever and from malarial diseases.
13. See No. 9.
14, 15, and 16. None.
17. Small-pox, 1; scarlet fever, 8; typhoid fever, 12; whooping-cough, 4; cerebro-spinal meningitis, 1; diphtheria, 8.
18. Cholera, measles.
19 and 20. No.
22. None.
23. No.
24 and 25. Do not know of any.
26. Corn, about the same amount of smut as usual.
27. Condition was fairly good.
28. Not that I know of.
29. Generally.
30. Have not heard of any banking.

31.† No mold or mildew.
32. *January:* Cold and stormy; snow.
February: Cold and dry the first; the last, heavy rains prevailed.
March: Wet early; later, some cooler and snows.
April: Warm, for April.
May and June: Hot and dry.
July: Hot and dry; showers around us.
August: Hot and dry; heavy rains west of us.
September: Hot the first of the month; later in the month, heavy rains and cooler.
October: Wet.
November: Warm and wet.
December: Warm.
33. May, June, July, August, and Sept. were dry. The latter part of Sept., Oct., and Nov. were wet.
34. May, June, July, August, Sept.
35. Winter and fall months.
37. About 35 feet.
41. In one family, 8 or 9 cases of typhoid fever and 2 deaths, where the son came home from a distance and communicated the disease to other members of the family.
42. Cases occurring seemed to arise independent of contagion.
43. In only one family could the disease be traced to its cause, from contagion. In another, foul water seemed to be the cause.
44. More care in removing noxious materials from around houses, better care of cellars, better ventilation, and better sewerage.

Very respectfully,
EDWARD H. HURD.
Union City, Branch Co., Feb. 23, 1882.

REPLIES BY S. C. VAN ANTWERP, M. D., OF VICKSBURGH, MICH.

1.† Eight hundred.
2. Fifteen.
3. Village of Vicksburgh.
4 and 5. Less.
5. Age of patients. Four were 80 years and over, two 75, three about 60.
8. Malarial fevers.
10. Lung affections.
17. Typhoid fever 4, measles epidemic, don't know how many.
18. Small-pox, cholera, spinal meningitis.
19. Yes, measles.
20. Schools have not been closed on account of sickness.
22. An influenza among horses, a sort of catarrhal affection of eyes, which run profusely, stiffness of joints, called by some pinkeye. Disease lasts four or five days. Very few cases of hog cholera.
24. Do not.
26. Crops gathered in good condition generally. Wheat crop small.
27. Buckwheat did not turn out well,—shelled out and kept blossoming.
29. Yes.
30. Very little injured.
32. There was more than the usual amount of rainfall during the fall months. August and early September were the driest portion, and October the most moisture.
35. Latter part of September and October.
36. Many or most of our wells are driven, and it is not easy to ascertain depth of water. As far as I have attempted there is quite a uniformity during the year, and wells are not much affected by the drouth or very wet weather.
37. 12 to 18 feet.
39. In October and latter half of September.
40. August.

Very respectfully,
S. C. VAN ANTWERP.
Vicksburgh, Kalamazoo Co., Jan. 18, 1882.

REPLIES BY EDWARD BATWELL, M. D., OF YPSILANTI, MICH.

1.† 6,000.
2. About 50.
3. Ypsilanti city.
4 and 5. About the same.
6. Typhoid fever.
7. Cannot.
10. Typhoid fever.
14. Do not know.
16. Typho-malarial fever in Nov. and Dec.
17. Typhoid fever, about 10; cerebro-spinal meningitis, 2 or 3.
18. Small-pox, cholera, scarlet fever, measles, whooping-cough, diphtheria.
19. No.
20. None. Never close the schools, believing that children playing in the streets together are not less exposed to contagion than if at school, when the children from infected families are not permitted to attend.
21. *January:* Intermittent, phthisis, influenza.
February and *March:* Intermittent fever.
April: Intermittent fever, cerebro-spinal meningitis.
May: Intermittent fever.
July: Intermittent fever, typho-malarial fever, rheumatism.
August: Intermit. fever, typho-mal. fever.
September: Intermittent fever, typho-malarial fever.
October: Typho-malarial, intermittent fever.
November: Typho-malarial, intermittent fever, bronchitis.
December: Typho-malarial.
23. Never observed.
25. None came under observation.
27. Good.
28. None.
29. Yes.
33. November, October, July.
34. November.
35. April.
37. About 25 feet,—varies according to distance from Huron river.
39. The dry weather of 1881 did not effect the height of water in the wells in this city.
42 and 43. None in the city.

Very respectfully, EDWARD BATWELL, M. D.
Ypsilanti, Washtenaw Co., January 10, 1881.

SOUTH-EASTERN DIVISION OF THE STATE.*

REPLIES BY JUDSON BRADLEY, M. D., OF DETROIT, MICH.

1.† In the city, 125,000; suburbs, 15,000 more.
2. 2,900.
3. Detroit and suburbs.
4. About 5 per cent greater.
5. About the average.
6. Scarlet fever, diphtheria, typhoid and typho-malarial fevers.
7. The dry weather increased typhoid and malarial fevers.
8. Small-pox.
9. Vaccination.
10. Typhoid and typho-malarial fevers and diphtheria.
12. Small-pox and measles.

Very respectfully,
JUDSON BRADLEY.
Detroit, Wayne Co., Mich., April 5, 1882.

*For counties included in each division, see Exhibit 1, page 287.
†The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 282-305 of this Report. A summary of the replies is printed on pages 283-305.

REPLIES BY E. S. SNOW, M. D., OF DEARBORNVILLE, MICH.

1.† Dearbornville is not incorporated.
2. 25.
3. The township of Dearborn, Wayne Co.
4. Diminished about one-fourteenth (1-14).
5. One-twelfth less.
6. Typho-malarial fevers.
7. Long continued drouth, during which low grounds, marshes and streams dried up.
8. Old age, inflammation of bowels and lungs, and all contagious diseases.
9. Moderate weather without sudden changes, and strict compliance with regulations for prevention of spread of contagious diseases.
10. Malarial fever.
12. Bowel complaints, and lung difficulties, and contagious diseases.
13. Equable climate.
14. None.
15. All inflammatory complaints and contagious fevers.
16. Cerebro-spinal congestion and irritation, from Oct. 1st to Dec. 31, 1881.
17. Typhoid fever, 1; Diphtheria, 8.
18. Small-pox, cholera, scarlet fever, measles, whooping-cough, cerebro-spinal meningitis,
19. No. Schools closed in village and one district for diphtheria; but in no case has it spread from the house where it first commenced.
20. No. In no case has a contagious disease spread from the house where it originated for the year 1881, or where it made its first appearance.
21. *January:* Malarial fever and nervous rheumatism.
February: Malarial fever and rheumatism.
March: Articular rheumatism and influenza.
April: Rheumatism and influenza.
May: Malarial fever.
June: Malarial fever.
July: Nervous fever.
August: Malarial fever.
September: Malarial fever and diphtheria.
October: Typho-malarial fever.
November: Typho-malarial fever.
December: Typho-malarial fever and diphtheria.
22. There have been no prevailing diseases among domestic animals for the year 1881.
23. Nothing of the disease in the township.
24 and 25. I do not.
26. An unusual amount of smut on corn.
27. Very good.
28. Corn badly.
29. I think not.
30. Usual proportion.
31. More.
32. *January:* Cold, dry and windy.
February and *March:* Low temperature and about usual amount of snow.
April: Cloudy, windy, but little water fall.
May: Few bright days and wet.
June: Cloudy, rainy, and ground saturated with water.
July: High temperature; bright and pleasant.
August and *September:* High temperature, less than usual rain fall.
October: Warm, cloudy, and very dry.
November: Light rains, moderate.
December: Warm, pleasant, with light showers, no snow.
33. August, September, July, October, January, February, March, December, April, November, May, June.
34. July, August, September, February.
35. May and June.
36. Jan., 8 feet; Feb. and March, 7; April, 8; May, 10; June, 12; July, 9; Aug., 6; Sept. and Oct., 4; Nov. 5; Dec., 8.
37. Sandy ground, from 6 to 12; clay ground, from 10 to 80 feet.
38. Jan., 8 feet; Feb., 9; March, 12; April, 8; May, 8; June, 0; July, 7; Aug., 15; Sept., 20; Oct., 19; Nov., 14; Dec., 12.
39. May and June.
40. August, September, October, November, and January.
42. None.
43. In two families out of four it was brought from Detroit. It was thoroughly quarantined, and in no case communicated to neighbors.
44. In the four families above referred to, I put the entire family under treatment at once, and no one took it when treatment was commenced before they really had it.

Very respectfully,
E. S. SNOW, M. D.
Dearbornville, Wayne Co., Jan. 11, 1882.

REPLIES BY J. M. SWIFT, M. D., OF NORTHVILLE, MICH.

1.† About 1,000.
2. There were 12 deaths.
3. Incorporated village of Northville, 1 mile square.
4 and 5. About the same.
6. Late in the year malarial influence more severe, but no deaths from it. Some cases of measles, which has not been common here; 1 death.
7 There was none, unless measles, communicated by a child brought from Holly.
10 and 14. None.
15. Typho-malarial fever severe in last of October and through November.
16. Measles from July 20 to August 20.
17. Measles, about 12.
18. Small-pox, cholera, scarlet fever, typhoid fever, whooping-cough, cerebro-spinal meningitis, diphtheria.
19. No.
21. *Jan., Feb., Mar., Apr., and May:* Nothing worthy of note.
June: Intermittent fever, consumption, typho-malarial; diarrhea.
July: Intermittents more violent form, typho malarial, diarrhea, consumption.
August: Diarrhea, cholera morbus 2, intermittent fever 2, measles 2, consumption.
September: Diarrhea 1, intermittent fever 1, cholera morbus 2, consumption 2, typho-malarial late in the month.
October: Typho-malarial fever, intermittent and remittent fevers 2, consumption, dysentery, rheumatism.
November: Typho-malarial and intermittent fevers, consumption, some neuralgia and rheumatism.
December: Typho-malarial fever, consumption, intermittent fever, rheumatism.
22. I cannot state if there was any.
23. Do not know; think not.
24 and 25. I know of none.
26. Not any.
27. Good.
28. No.
29. It was.
30. Have no knowledge.
31. A little more, perhaps.
36. Not much variation during the year; from 2 to 3 feet.
37. On south and western sections, fountains pour forth large quantities of pure water. Wells in other parts varying from 30 to 50 feet.
38. The soil is on gravel, which is in a stratum of from 30 to 40 feet, and no water stands or accumulates in this stratum until it reaches the clay upon which it lies, for any long time. On the south, beyond the populous portion of the village, the surface dips down to a stream, and along its border there is quicksand and water near the top of the soil.

40. October, after much rain at such point as indicated in answer to 38.
41. A solitary case of typhoid fever in a patient who had been away from home.
42 and 43. None.
44. Conditions very healthful now; not much improvement can be made. There were 12 deaths in 1,000 population; average age of decedents, 47.75 years; only two deaths from acute disease. Very respectfully,

J. M. SWIFT, M. D.

Northville, Wayne Co., Mich.

REPLIES BY W. G. ELLIOTT, M. D. OF PONTIAC, MICH.

1.† 4,500.
2. 63.
3. Six square miles (2 by 3 miles).
4. Increased from one-half to three-quarters.
5. Increased from one per cent in 1880 to one and four-tenths per cent in 1881.
6. The increase of deaths was principally among extreme old and young.
7. Unusual prevalence of contagious diseases and extreme heat.
8. None.
10. Cholera infantum and infirmities of old age.
11. Long continued heat.
12. None.
14. Cholera infantum occurred from July to October; the deaths were, compared with the year previous, 7 to 21; old age, 2 to 9.
15. Scarlet fever.
16. Small-pox, diphtheria, scarlet fever.
17. Small-pox, 25; scarlet fever, 50; measles, 10; whooping-cough, 15 to 30; diphtheria, 10 to 20.
18. Cholera, typhoid fever, cerebro-spinal meningitis.
19. Yes; scarlet fever.
20. No; the schools have not been closed. Scarlet fever has been so mild that many cases have been treated by the parents, not calling a physician.
21. *January:* Bronchitis, influenza, rheumatism, pneumonia, tonsilitis, neuralgia, diphtheria, consumption.
February: Bronchitis, rheumatism, pneumonia, influenza, neuralgia, scarlet fever, consumption.
March: Bronchitis, rheumatism, scarlet fever, influenza, measles, pneumonia, neuralgia, tonsiltis, consumption.
April: Scarlet fever, bronchitis, influenza, rheumatism, small-pox, measles, intermittent fever, pneumonia.
May: Intermittent fever, diarrhea, cholera morbus, cholera infantum, rheumatism, pneumonia, pulmonary consumption.
June: Intermittent fever, diarrhea, scarlet fever, German measles, cholera infantum, cholera morbus, pulmonary consumption.
July: Intermittent fever, diarrhea, cholera morbus, cholera infantum, rheumatism, whooping-cough, pulmonary consumption.
August: Diarrhea, intermittent fever, cholera morbus, cholera infantum, dysentery, remittent fever, rheumatism, whooping-cough.
September: Diarrhea, intermittent fever, remittent fever, cholera morbus, cholera infantum, dysentery, typho-malarial fever, whooping-cough.
October: Intermittent fever, diarrhea, dysentery, remittent fever, typho-malarial fever, cholera morbus, rheumatism, pneumonia.
November: Bronchitis, intermittent fever, rheumatism, diphtheria, pneumonia, scarlet fever, remittent fever, diarrhea, tonsilitis, whooping-cough.
December: Bronchitis, intermittent fever, rheumatism, pneumonia, scarlet fever, tonsilitis, whooping-cough, pulmonary consumption.
22. November and December, a disease among horses, affecting the mucous membranes of nose, throat, and lungs.
23, 24, and 25. None.
26. Do not know of any.
27. Very dry.
28. None.
29. Yes.
30 and 31. Less.
32. *January to June:* Not noted.
July: Very hot and dry; last days of month thermometer 100° to 102° in shade.
August: Very hot and dry; thermometer 80° to 100°; 6th, slight rain; many wells dry.
September: Very hot and dry; slight rain 1st and 8th; many wells dry.
October: Temperature 60° to 70°; rain 1st, more than at any time since June; latter part of month wet.
November: Wet and mild; frequent rains; latter part of month cool; snow and rain.
December: Temperature 16° to 60°; slight storms of rain and snow.
33 and 34. August, July, September.
35. November, March, and April.
36. January, February, March, and April, 3 to 15 ft.; May and June, 2 to 12 ft.; July, 2 to 8 ft.; August, 0 to 6 ft.; September, 0 to 4 ft.; October, 0 to 4 ft.; November, 2 to 12 ft.; December, 3 to 15 ft.
37. From 8 to 90 ft.; varies greatly.
39. January, February, March, April.
40. August, September, and October.
41. The small-pox was brought from San Francisco by a criminal.
42. Supposed to be from clothing.
43. Not known.

Very respectfully,

W. G. ELLIOTT, *Health Officer.*

Pontiac, Oakland Co., January 23, 1882.

REPLIES BY E. A. CHAPMAN, M. D., OF WALLED LAKE, MICH.

3.† Part of each of the following townships: Commerce, Novi, Farmington, and West Bloomfield.
4 and 5. About same.
6. Typhoid fever.
17. Opinions: Typhoid fever 10, whooping-cough 25, diphtheria 2.
18. Small-pox, cholera, scarlet fever, measles, cerebro-spinal meningitis.
19 and 20. No.
22. I don't know of any.
23. No.

Very respectfully, E. A. CHAPMAN.

Walled Lake, Oakland Co., Feb. 4, 1882.

REPLIES BY E. P. CHRISTIAN, M. D., OF WYANDOTTE, MICH.

1.† 4,000.
2. About an average; probably about 50.
3. City of Wyandotte.
4 and 5. An average.
6. Diphtheritic croup in winter and spring.
8. Scarlet fever and measles.
10. Diphtheritic croup.
12. Scarlet fever.
17. Typhoid fever, many; whooping-cough, many; cerebro-spinal meningitis, 1; diphtheria, many.
18. Small-pox, cholera, scarlet fever, measles.

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† The figures beginning paragraphs refer to questions in Circular 50, printed (in small type) on pages 282-305 of this Report. A summary of the replies is printed on pages 283-305.

19. Yes; diphtheria.
20. Yes; diphtheria very much lessened during summer vacation.
21. *January:* Bronchitis, rheumatism, diarrhea, pneumonia, diphtheria, remittent fever, typhoid fever, whooping-cough.
February: Rheumatism, diphtheria, bronchitis, diarrhea, membranous croup, erysipelas, pneumonia, intermittent fever.
March: Diarrhea, rheumatism, bronchitis, pneumonia, diphtheria, erysipelas, membranous croup, cerebro-spinal meningitis.
April: Rheumatism, diphtheria, intermittent fever, remittent fever, bronchitis, rötheln, diarrhea, erysipelas, consumption.
May: Diphtheria, intermittent fever, rheumatism, diarrhea, consumption, bronchitis, cholera morbus, pneumonia, inflammation of brain.
June: Intermittent fever, diarrhea, rheumatism, consumption, bronchitis, membranous croup.
July: Diarrhea, intermittent fever, cholera morbus, remittent fever, bronchitis, consumption, dysentery, typhoid fever, puerperal fever.
August: Intermittent fever, remittent fever, diarrhea, consumption, cholera morbus, cholera infantum, rheumatism, puerperal fever, dysentery.
September: Intermittent fever, remittent fever, diarrhea, cholera morbus, cholera infantum, diphtheria, rheumatism, consumption.
October: Intermittent fever, remittent fever, diarrhea, diphtheria, bronchitis, typhoid fever, rheumatism, consumption.
November: Typhoid fever, diarrhea, diphtheria, intermittent fever, remittent fever, consumption, rheumatism.
December: Typhoid fever, diarrhea, diphtheria, bronchitis, intermittent fever, rheumatism, consumption.
22. Epidemic influenza, so called epizoötic among horses; also so called chicken cholera. No others so far as I know.
29. Yes.
30 and 31. Less.
41. It is perhaps worthy of notice that in several instances typhoid fever and diphtheria have existed together in different members of the same family, both in severe form.

Very respectfully, E. P. CHRISTIAN.
Wyandotte, Wayne Co., Mich.

PUBLIC HEALTH SUBJECTS

BEFORE THE AMERICAN SOCIAL SCIENCE ASSOCIATION, AT ITS MEETING IN SARATOGA, NEW YORK, SEPT. 5-8, 1882.

BY HON. LEROY PARKER, OF FLINT, MICH.

GENTLEMEN OF THE STATE BOARD OF HEALTH:—In accordance with your request, I attended as the representative of this Board, the annual meeting of the American Social Science Association, held at Saratoga, Sept. 5, 6, 7, and 8.

The meetings of the Association were more numerously attended than ever before, and an unusual degree of interest was manifested in the proceedings of the various departments. This was particularly noticeable upon the day devoted to the Department of Health, when a number of interesting and instructive papers were read, and some valuable discussions had upon the various topics presented.

The meetings of this department were presided over by Dr. Walter Channing, of Boston, who for the past two years has acted as chairman of the Department of Health. Much of the success which attended this and the previous meeting has been due to the careful and judicious management of Dr. Channing in selecting timely subjects for presentation, and able and experienced sanitarians to prepare the papers to be read. A change in the Secretaryship of the Department of Health was made at this meeting, Dr. Ezra M. Hunt, of Trenton, New Jersey, Secretary of the New Jersey State Board of Health, being elected to succeed Eliza M. Mosher, M. D., of South Framingham., Mass.

Dr. Channing in his opening address stated that correspondence among the members of the Health Department had brought forward two prominent subjects for discussion, as follows: "Inebriety," and "The influence of places of detention on the health of females," which were presented in papers read before the association, the first by Dr. A. N. Blodgett of Boston, and the second by Eliza M. Mosher, M. D., Superintendent of the Massachusetts Reformatory for Women at Sherborn, Mass.

Dr. Channing said, in reference to boards of health:

I cannot look at the vast work which has been accomplished by boards of health within the past few years without amazement. Coupled with this surprise, I have a feeling of the liveliest satisfaction; for in these boards I see the beginning of that rational struggle with disease which soon will check our rapid progress toward physical degeneration. Dr. Farr, the great English specialist in this branch, once said: "How, out of existing seed, to raise races of men to divine perfection

is the final problem of public medicine"; and this problem health boards have already done much to solve. Only in the year 1869 the Massachusetts Board of Health, the pioneer State board in America, was formed. We find in section 2 of the act which created it the following words, which in some measure explain the contemplated nature of its work: "The board shall take cognizance of the interests of health and life among the citizens of the Commonwealth; shall make sanitary investigations and inquiries in respect to the people, the sources of disease, and especially of epidemics; the sources of mortality and the effects of localities, employments, conditions, and circumstances on the public health."

Dr. Henry I. Bowditch, of Boston, known far outside of Massachusetts as a prominent physician, and a man of remarkable humanity and kindness, had the subject of sanitary science very deeply at heart, and it is to his clear-sighted vision and appreciation of the needs of his fellow-men that much of the success of this first board is due. He was its first chairman, and in his opening address he said: "Our work is for the far future as well as for the present." It is not to be supposed, however, that he even dreamed of what has already been accomplished in the thirteen years since his address.

The only way in which it seems possible to account for this discovery, as it may be called, of "boards of health," is that the time was ripe for their advent. We have found our nineteenth century civilization bringing with it many, even innumerable advantages, improvements and ameliorations, but we have found associated with these things a great variety of diseases. We have civilized whole continents, built magnificent cities, turned night into day, conquered time, but have lost the art of healthful living. Happily, however, the advances in medical science during the last quarter of a century have established a more rational method of regarding disease, and have brought us to think less of cures and more of prevention. This progress in medical science, combined with the great pressure that has been made on us by the diseases of civilization, so long unheeded, has obliged us to turn our attention in this direction. Furthermore, human nature itself has become more rational and reasonable, and less inclined than in former times to be pacified, cheated and cured by the mysticisms, panaceas, and dogmas of a well-meaning but often misguided medical faculty. Education has made the masses less influenced by superstition, and though investigations in hygiene were made prior to the establishment of boards of health, it was not until after that time that systematic investigations were made. Increased knowledge of the laws of health have educated the people to recognize that such laws are in force and must not be neglected, but obeyed. While yet far from accomplishing all that can be done, the gigantic work still goes on bravely, and it is to be hoped not only the faculty but also the laity will assist in its furtherance. The terrible infant mortality in New York and other cities, for instance, makes us painfully aware of the vastness of the work to be done. Dr. B. W. Richardson said recently that he had never seen a perfectly healthy child, and it might be safely said that no child was born free from the taint of disease. It was inherited defects which accounted largely for the enormous infant mortality. These remarks indicate one of the directions in which health boards should work. Other fertile fields of inquiry may be found in nervous diseases. A whole generation of nervous invalids has sprung into existence, reaching from simple irritability into fully-developed insanity. The causes must be found in a wide study of American life, and they are indeed multifarious. Continuous over-pressure extends into professional and business life, and the struggle to meet these extravagant demands becomes harder. Excessive education of boys and girls of tender age is another evil. The minds of some will not retain the knowledge poured in, but with others the pressure makes a break. Boys here have a great advantage over girls. In the education of the future it will be imperative that more attention be paid to the physical education and less to mere intellectual development. This attention is already beginning to be paid. We should, as an association, study deeply into the subject of heredity; the physical education of girls and boys; domestic employments; the causes of nervous disease and insanity.

Dr. Channing closed his valuable address by quoting some words from Dr. Oliver Wendell Holmes upon the progress in the art of prevention.

The opening address by Dr. Channing was followed by an exceedingly interesting paper prepared by Dr. Henry B. Baker, Secretary of the Michigan State Board of Health, which I here present in full:

THE MICHIGAN PLAN FOR GENERAL BOARDS OF HEALTH.

So far as known to the author of this paper, the Michigan State Board of Health was the first board of health purposely established on its plan,—which plan may be briefly outlined as follows: It provides for the collection and dissemination of information, and the general advisory supervision of all health interests of the people within the State; but does not give the Board power to enforce any orders, other than those connected with its functions just stated. I say "purposely established," because there have been and there still are many local boards of health which,

although theoretically supposed to be effective organizations for the public safety, yet are so hampered by lack of power and means which should be given them by the city council, or other local authority, that they can do little or nothing for the public good. Such local boards may get hints of methods of useful work, which even with their limited means they could adopt, from study of methods employed by the Michigan State Board of Health; but the theory of the law in Michigan is that the local boards of health should have the power, and should do the work of combatting local nuisances and all other local causes of sickness, including the restriction of contagious diseases. The State Board was established to serve as a generalizing center; to do for the local boards somewhat as the general does for the troops in the time of war,—ascertain the whereabouts of the enemy, spy out and give warning of the very first indications of threatened approach of an epidemic disease, secure prompt report to headquarters of every item of information which can be made available for the good of all, study up the best methods of drill and warfare, and communicate the same to the several local officers and men who are constantly employed in the real work of combatting the enemies, which in this case are not very infrequently the same as in time of war, namely, human beings, who think that they have interests different from and antagonistic to those of the great majority. In such cases the local health authority needs to know just what it can do, and the State Board of Health organized on the Michigan plan, can usually respond immediately to the question by references to the law and to best methods of procedure. But oftener than such demands for information come those on the occurrence of a communicable disease, such as scarlet fever, diphtheria, or small-pox, when the local health board, which has usually never before had to deal with such a case, needs to know immediately what are the measures which need to be inaugurated and maintained until the danger is over; then if there is a State board of health on the Michigan plan, appeal to it for instruction can usually have as ready response as an appeal to a commanding general for orders, and the best available knowledge (which has resulted from the collection of the information of the best methods of any or all of the local boards of health) can immediately be placed at the disposal of the local board, thus enabling it to do in its emergency vastly better than would otherwise be possible.

That, in order to avoid or prevent a disease we need to know its cause, is considered a truism: yet little general systematic effort to gain such useful knowledge is being made, nor is it likely to be made, unless by some such means as by general boards of health. For any progress in the knowledge of the causes of diseases, facts and statistics of great numbers of cases of sickness from these diseases, and of the conditions which were coincident with such sickness, are essential; and such facts and statistics cannot, by any local board, be collected in sufficient numbers, nor over sufficiently wide areas, to throw out the influence of local circumstances; so that for any such progress in knowledge it is essential that there be a general board of health to collect and collate the fragmentary material which the local boards of health can supply, and from it learn the laws which prevail in the production of disease and death. For such work, also, time is required, and a more continuous length of service than is usual for local boards of health to give, because of political and other changes. Until very recently there has been no material progress in knowledge on such subjects; yet enough has been learned to show that such knowledge can readily be gained by systematic efforts to obtain it. There is, apparently, no difficulty in learning the causes of every disease. Sanitarians know enough to begin and carry on the study, the collection and collation of the necessary facts, and the experimental proof of the modes of the production of disease. They are ready to do this work as fast as governments are sufficiently intelligent to appreciate it. They wait for governments because though it is work which benefits all mankind, unless mankind through its organized governments provides recompense, the benefit to the individual worker is not sufficient compensation; they can make more money as physicians treating the people for diseases which the people do not know enough to avoid or prevent, but which they pay roundly to be treated for when once the sickness has come upon them.

But such boards of health as we have known in the past could never ascertain the causes of diseases. As well might one expect the soldier in the field, loaded down with his knapsack, his rations, and his weapons, and fighting with a musket, to be able to learn the exact whereabouts of the enemy's forces and his reserves, and be able to plan and successfully execute a battle. The commanding general does not carry a musket. So the general board of health needs to be free from the immediate battling with local nuisances; and the larger the nuisance, the greater is the necessity for freeing the general board from combat with it. The Massachusetts State Board of Health was first organized on the theory that the gigantic nuisances in the State were to be dealt with by it. That Board did good work, but no one will deny that while engaged in the celebrated case of "Tyler *et al. vs.* Squires *et al.*," etc., it could not, as otherwise it might, devote all its energies to searching out the causes of diseases, nor towards generalizing and systematizing the public-health work of its State. That Board maintained its existence for about ten years, and then ceased as an independent and separate board,—its functions, however, in its present condition as a mixed board becoming more nearly like those of the ideal general board—on the Michigan plan; although the public health, being only one of several subjects considered by the present Board, it may not receive that undivided attention of specialists which the importance of the subject warrants.

At the time, and long previous to the time, the National Board of Health of the United States was organized, the author of this paper pleaded* and here continues to plead for the maintenance of that general board of health, which shall do for the United States what a State Board of Health on the Michigan plan aims to do for a State — a commission or board which shall systematize and utilize the vital statistics in the United States Census, and all the information now collected by all the Government departments, and which should otherwise collect and disseminate information essential to the best public-health work in this country.

If the United States will maintain such a generalizing center of public health work in this country, we shall soon see the grandest progress that the world has ever witnessed; for it will set in operation a movement which cannot fail to yield knowledge of the conditions under which each and every disease proves destructive of human life and happiness. But in this most important work which a government can undertake for a people—a work which is designed to accomplish a greater amelioration of their condition than has any previously undertaken in this or any other country,—it is essential in order to secure the best results, that the central generalizing body shall have the confidence and co-operation of the great body of sanitarians throughout the whole country, and of a large proportion of the local and State boards of health, whose work is by it to be consolidated for the public good. Such has been and is the case as regards the National Board of Health; but the government has recently taken a much regretted step backward by abolishing one of its means of prompt dissemination of information, namely, the weekly bulletin, and by crippling one of its sources of information,—that by its inspection systems, which had just begun to yield information valuable for incorporation with that from other sources.

Members of Congress seem to be unable to appreciate the fact that movements for the prevention of diseases, are of vastly greater importance than are those measures designed simply to palliate the results of the neglect of such prevention; for we learn from the Congressional Record that recently large sums of the public money were freely voted to build hospitals for a small, special class of citizens, or at least persons, while these same Congressmen failed to vote to freely sustain the National Board of Health in its work, which is for the good of every citizen of the country, and even for humanity throughout the world. Palatial marine hospitals in each large sea port, for the special benefit of a few sailors, sick with syphilis and other preventable diseases, may be proper objects for Congress to spend the people's money for; but sooner or later stinging criticisms will attach to such action by our representatives; especially if, as was recently the case, the neglect to provide the means for the most successful work by those charged with the highest duties which can be undertaken,—inquiries into the causes and best means of preventing all diseases which are yet permitted to interfere with the "life and the pursuit of happiness," by those who maintain this government for the people.

Comparatively little has yet been done in this country toward the systematic work which has been suggested in this paper; for the reason that individual effort cannot accomplish it, and those we elect to govern us have not all informed themselves on the subject. Sanitary science is one of the latest sciences. It utilizes sciences which also are new. Already with reference to several of the most important diseases, it enables us to predict their proportional increase or decrease just as far in advance of their occurrence as the meteorologist can foretell the weather; thus giving, in general terms, the curves by seasons, and even by months of the year; and we are able to add to this the specific prediction of the proportional increase or decrease for the immediate future within about the range of probability reached with respect to the weather, upon which the particular diseases referred to greatly depend. But in such studies it is needful to include facts relative to wide areas; in fact what the United States signal service gains for meteorological progress by being able to generalize its work throughout the whole country, may easily be paralleled by the gain in sanitary science by a similar broadening of the field of view, from local and State to that of a properly sustained National Board of Health. Whenever that is done, the signal service itself will have its usefulness wonderfully enhanced, because its work will be made available for use in saving human life in ways not now imagined by many people, yet which those most actively engaged in public health work know, are not only possible but are entirely practicable. May the day soon come when we may be permitted to see such beneficent results.

The paper by Dr. Baker was discussed by Secretary F. B. Sanborn, who thought that State Boards of Health should be invested with administrative powers; that the outbreak of epidemics of small-pox and other diseases dangerous to the public health could be better checked and suppressed by the action which the State boards might take, than if administrative functions were permitted to local boards alone.

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* Pages 356 and 360, Trans. Am. Med. Asstn, 1874. Also pages 15–18 Reports and Resolutions Relating to Sanitary Legislation, presented to the Am. Pub. Health Asstn., at its meeting in Richmond, Va. Nov. 19-22, 1878. Riverside Press, Cambridge, Mass., 1878. Also Vol. IV., Trans. of the Am. Pub. Health Asstn.

In reply to Mr. Sanborn's remarks, I advocated the theory of Dr. Baker's paper, and contended that it was not necessary for State Boards of Health to be invested with power to actively engage in dealing with particular cases of dangerous disease; that the local boards could more effectively deal with the cases within their jurisdiction than a State Board, whose members might be remote from the place where a dangerous disease showed itself. That in our State the aim had been to emphasize the system of local boards, and to throw the responsibility of caring for diseases upon the municipalities themselves.

As an introduction to Dr. Blodgett's paper on Chronic Inebriates, Dr. Channing in his address made remarks of which the following is an abstract:—

We are told that insanity has greatly increased during the last few years, and if we turn to asylum reports for an explanation of this statement we see many causes assigned. Sometimes it is ill health, business anxiety, family affliction, religion; sometimes more remarkable causes, such as the following, which I saw mentioned recently: "Slander, fear, fright, remorse, revenge, anxiety, spirit rappings, camp life, loss of law suit," etc. At the asylum where these statistics were tabulated, 5,052 patients had been under treatment since 1855, and the assigned causes in these cases were physical in 2,070 cases, moral in 1,260, and unknown in 1,722. We do not doubt that these causes were the direct and exciting ones. But were there not many others? Could the moral be separated from the physical causes? Did not the heredity of the patient play a part? Notwithstanding the inference to be drawn from the medical testimony in the recent Guiteau trial, that heredity is not of much account, I fear that we must agree with Dr. Richardson and others that it is of vast importance. But the causes of nervous and mental disease are most varied and complex, and we shall make a sad mistake if we attach too much importance to one element only of this involved causative.

If we search for causes of mental and nervous instability in our daily life we shall be at once impressed by the fact that our lives are too full; that we are laboring under a heavier load, socially, than we are able to carry. There is too much to be done. There is too much literature, too much art, too much music, too much science, too many theatres, too much dress, too much social gayety. Such a multiplicity of important objects in life wearies and overtasks our mental powers, and renders us less able to successfully struggle against the cares and responsibilities that are imperative. If Mr. Bert is right when he says, "When you educate boy, you perhaps educate a man; and when you educate a girl you are laying the foundation for the education of a family," we cannot well over-estimate the importance of the proper physical education of young persons, especially girls.

Dr. Blodgett pursued the same topic in his long paper, and said, among other things:—

The expression of increased nervous excitability is observed in nearly all the ordinary walks of life, and in all conditions of people. Within the memory of most of those present there have been such changes in the personal observation of each one as to verify this assertion. The causes are manifold, and reach into almost every avenue of life. The abolition of principle, which is to the mind what the pole-star is to the mariner, is one of the most fatal accidents which can befall any individual. Its absence leaves the mind without a proper degree of rectitude; without that necessary steadfastness of purpose and consistency of method which are essential to healthy and vigorous mental activity. Weakness and debility of the mental functions must as surely follow its loss as physical infirmity succeeds the loss of any material condition of animal life. The cumulative result of this defect is continually augmenting, like that of the opium habit, or any other profound and growing influence operating upon the foundations of being in the individual. Business speculation has been a powerful agent in disturbing the mental equilibrium of very many people within the past few years. Increased mental vulnerability of our population is caused by changes in the private and domestic life of the people. The aggregation of people in large cities tends to injure the home life, and its quiet restraint and peaceful influences are lost to those natures which most need them. If, now, unfortunate individuals become the slaves of passion or appetite, in any specific form, their bondage will be more oppressive from the lack of a powerful will to resist, and a firm principle to guide, and the danger from encroachments of other vices will be augmented owing to diminished power of self-control due to the degeneration or abolition of standard mental qualities. Human nature cannot indefinitely support the increased strain to which a continually enlarging number of persons is continually exposed. Natural food and natural rest will not provide for unnatural and superhuman exertion. There is a limit to all healthy energy. Beyond this limit labor is acomplished only at the expense of vitality. In this extremity—which is exactly the condition in which a large number of our people find themselves—the use of artificial stimulants is

necessary in order to follow an irrational and insane ambition. There is a sensation of exhaustion, which imperatively demands the aid of a stimulant, and is temporarily relieved by its employment. The individual is led to think that the remedy has been found, and continues the use of an agent which has afforded such marked benefit. Any article which thus becomes necessary to the performance of daily labor may gradually acquire such power over the individual that the force of habit, combined with the physiological action of the substance, may at length render all efforts at its abandonment entirely futile. The cumulative effect of prolonged over-stimulation is two-fold: first, the action upon the nervous system as a spur by which an extra amount of energy may be temporarily evolved, with a gradual encroachment on the normal powers of the organism, until no extra energy can be awakened except from the effect of stimulation; and second, a change in the physiological and organic relation of the structural elements composing the nobler functional organs, with gradual degeneration of the higher mental and moral qualities, so that the foundations of character are undermined, and the powers of reason are perverted, while the emotions and sympathies are excited to increased activity, and the unfortunate individual becomes a slave to sudden and irresistible impulses.

It is, therefore, not strange that the victim of drink often becomes a charge to society. He should not be considered a hardened criminal but a sick and diseased person. These persons should be treated, but there is not an institution nor an establishment adapted to give them remedial or curative treatment, or for their care, if incurable. These victims are generally found among the poorer classes and are brought to notice through the commission of crime, though his lack of moral perception may be entirely wanting. Of the institutions founded to treat these unfortunates, some are conducted by private enterprise to make money, and those established by government at public expense. The first has many defects, the first being that the patient is a boarder and is kept only as long as he pays, without regard to his condition. Also the patient dislikes the restraint, and often leaves before cured. The only institutions recognized by governments for such patients are prisons and madhouses, from whose walls he emerges with an indelible stigma. In view of the existing facts, we are safe in asserting that no wise, humane, and practical plan has been found to insure protection to society and justice to the individual. To suggest a remedy is not so easy. There must be, however, a suitable disposition of authority which shall place these people within the control of some restraining force. There must be a judicious amount of physical toil to induce fatigue and desire for sleep, open air life, strong and nutritious but unstimulating diet, regular habits, and abundance of sleep.

Dr. Blodgett's paper was earnestly discussed. President Wayland said if a drunkard can be cured he should be in a reformatory, and if he cannot be cured he ought not to be outside of one.

Judge Peabody, of New York, said the drunkard was insane, not only as regards his appetite but in other respects. He is responsible for the course of conduct which has brought about his insanity.

Rev. Mr. Humphstone believed that drunkenness was a disease.

Dr. Channing differed from Mr. Humphstone and contended that drunkenness was a crime.

Rev. Irenæus C. Prime, editor of the New York Observer, earnestly insisted that intemperance was a crime and not a disease. It begets disease. Crime is sin against God and man, and that is what intemperance is. This is not a question to be looked at in the light of remedies for disease; not what we shall do to cure men of intemperance as we cure men of small-pox and the fever and ague. Physicians and social scientists who teach this doctrine have committed an immense injury to the cause of reform of our unfortunate fellow men, because they paralyze the arm put forth to save them, and set us upon a track which has hitherto lamentably failed in its efforts to save and reform. The remedy for this great evil was in the hands of the State, and the way to do that was to prohibit the sale of intoxicating liquors. We must legislate to destroy the source of the evil. If it is a disease, let the law arrest it. If it is a crime, apply the law to stop it.

A paper prepared by Dr. Ezra M. Hunt, Secretary of the New Jersey State Board of Health, upon the health care of households, with special reference to house-drainage, was read, of which the following is an abstract:—

The term house-drainage, as now most frequently applied, has reference to the removal of all soiled liquids, and of such offaling, secretions, and excretions as are easily or naturally reduced to a liquid or semi-liquid state.

The principal fact as to this removal is that it shall be made without undue delay. The rule is that in a health-preserving or disease-breeding sense, no such liquid or offaling is objectionable until 12 to 18 hours after its production or voidance.* Hence all arguments as to the insanitary effects of its handling, or of its conveyance to rivers, are futile, if only you can insure prompt delivery. To call it *filth*, in a diseased sense, at the start, and to argue against its conveyance because it has odor, or, because of detention, it becomes pestiferous, is no more reasonable than to judge tomatoes unwholesome because decayed tomatoes are sickening. This point is important to be made, because so many arguments as to river-pollution, or as to the evils of other transportation and delivery of sewage, are based upon the assumption that fresh sewage is unsafe. It is only unsafe to those who store it, or who do not succeed in getting rid of it before it becomes stale. The one centre problem to solve in house-drainage is, how to get clear of fresh sewage.

An answer often, and perhaps always in order, is to have as little of it as possible. If a proper care is taken not to over-produce in certain directions; not to use water extravagantly; to properly separate such dry material as does not necessarily find its way into water-carriage, and thus to fairly limit quantity in feasible directions, much of the evil arising from needless accumulation would be prevented.

A second answer, in many cases, is to apply the principle of separation and separate dealing with different products, as well as that of quick removal. Thus, in a small garden, it is very proper to throw the Monday wash-water around the grape-vines, and the dish-water of each day around some other selected plants in succession, when it would not be feasible to throw all in one place, or to throw some of the products in any visible place. The principle of division of labor as required by plants is as applicable as when applied to animals. It is with this view that there are many advocates of a dry-earth system which seeks to take charge of the more solid excreta, to carefully select all garbage, and then to pass to the flush tank and drain-tile system, or small sewer system, all other composit liquids.

Where there are no sewers, the close application of methods of separation is of the greatest importance. The laundry and kitchen slop fluids can be largely disposed of upon the lawn, or in a cultivated strip of the garden. Garbage can be separated for punctual delivery, to classes not difficult to find, if only there is this kind of selection. The ashes are carefully sifted for admixture with the excreta, or dry earth is made the safe deodorent and disinfectant therefor. The greatest objection to it is that it serves as a kind of excuse for the longer retention of refuse about the house, which is of doubtful propriety, as the rendering innocuous is not always perfect.

Where this separating plan is adopted, the same kind of care as to material used for conveyance is to be employed as where the conveyancer is a pipe. Since the vessels are at times open, and so traps do not avail, soap and water, scrubbing, airing, and drying, and all cleanliness come largely into requisition. Tubs should be metal-lined, or so handled as to secure them against saturation; the kitchen sink should always be of metal that admits scrubbing, and the delivery pails equally adapted. The garbage-barrels should be of size, shape, and material adapted to quantity, and should be replaced by a cleansed one each time there is removal, and so secure the advantage of a prompt replacement by a vessel that brings back neither particles nor odors of what was carried away.

The earth-closet must also have its mode of use and frequency of earth removal, such as to avoid all odors, or all possibility of a retention of stored filth instead of clean dirt. It is too often forgotten that the closet must have its well-aired room, of easy access to draughts, and that the commode used must be so left and kept as to admit of the freest circulation of air. Without this there comes a confined smell and a mawkish, sluggish air, both uncomfortable and unhealthy. Every law as to ventilation applied to a house water-closet needs equal provision and enforcement where an earth-closet is kept. Indeed, the rooms or places in which any vessels are kept, which are used for soiled liquids, garbage-tubs, etc., need more care of ventilation, dryness, and sunlight, than do any other parts of the building.

It must be remembered as to all rooms in which garbage or other material is being separated for removal, that fresh, pure air, free from undue dampness, is a great desideratum. It is a chief objection to cellar kitchens or to underground store places for refuse, that the absence of light, the dampness and the impeded circulation of air afford conditions favorable only to the lowest forms of vegetable life, and that these seem easily to invade animal life as found in man.

The first principles of house drainage are, (*a*) that wherever there is a sink, bowl, closet, or any other contrivance for the reception of slops or excreta, it must be made of such smooth, non-absorbent material as will not retain either soiling or odor and be so accessible as to admit of the free use of soap and water; (*b*) that at, or near the joining of the out-going pipe to such receptacle,

* [Dr. Hunt would probably not assert this of sewage containing excreta from persons sick with specific or communicable diseases; cholera, however, being one disease of which the statement is generally believed to be true.—H. B. B., Sec. S. B. of H.]

there should be a trap or seal which will not admit of the return of any gas through it; (c) that beyond that trap and at the exit of the pipe from the building, there should be free opportunity for the circulation of common air. This generally means that at the point where the main house-pipe emerges from the building, there should be such communication of the pipe itself with the outer air as to freely admit it.

The complaint that the water which forms the trap is soiled and absorbs gases from the outer side, so as to pass them within, does not seem to be sustained unless the liquid itself is already poison, or the trap is so seldom used as to allow the trap-water to become intensely stale or to evaporate entirely away. Because this often occurs in summer hotels during their disuse the rest of the year, it has been proposed to remove all the traps at the end of a season, empty them and fill them with oil, or pour down enough oil to force out the water in the trap. That water trap is most perfect which is just deep enough to make a complete seal, which is so smooth as not to retain any organic matter, and which is of that shape which leaves the least inside surface untouched by the flowing stream. It is because an S-shaped trap leaves less than a D that it is generally preferred. Such traps as the Bell trap are disapproved because, in addition to an unwashed surface, they provide a kind of small local cesspool. There is a slight modification sometimes from the S trap such as we see in the Adee, to provide against possible syphonage in some cases, to which we shall allude hereafter.

The Bower trap is a specimen of kinds which do not rely entirely on a water seal, but use the water to float a ball or control a valve so as to close against the inflow of foul air. * * *

But a still brighter and better idea has of late supplemented the science and the art of a sweet home. It is that the gases of decay, as found in house pipes or sewers are mostly the result of the deprivation of common air in circulation: that the way to avoid sewer or house gas is not to make it, and the way not to make it as to correct it, if it exists, is to allow every pipe to be thoroughly flushed and cleansed by the active circulation of pure air. That is the valuable thought on modern house drainage or sewerage. It is so to construct pipes as that at each extremity there shall be the best opportunity for the ingress or egress of common air. It is for this reason that it is now insisted that every main soil-pipe should have an opening above the roof, and another as it emerges from the building, with no trap intervening in its course. It is assumed that all the pipes leading into it from closets, etc., on the different stories, will be so short as that their connection with the main pipes will secure for them a draught sufficient to dispense with that opening at each end, upon which as a rule we depend for draught.

This principle of a soil-pipe permitting the free ingress and egress of common air is now, we think, the ruling idea of house sewer-pipe arrangement. Details are not as yet completely settled. We need a little more testing and computation to assure us when and where not there will be such currents in pipes open at both ends, as will secure a sufficient flush of air. What is the best size of tube; how in case of stagnant or insufficient current activity is to be secured; how far the main tube can be depended upon to secure ventilation of side tubes; how far heat may be made available as a motor of air in tubes; and many such questions not difficult of solution when accurate tests in sufficient numbers shall be made. * * * Only we must be sure that in our pipes air actually does flow as we believe it does. Every chimney does not draw enough, and every tube heavy with foul or damp air does not have current enough.

An adequate draught here is not merely for carrying away, but for oxidation and other chemical transformation. A large bellows blowing into a pipe will purify its air faster than water, while suction not only displaces but propels the sewer air.

Alternate air-flush and water-flush can therefore be said to be the modern disinfectants for pipes. We are yet to be assured just how best to make sure, sufficient currents of air through pipes. We are to remember a calibre of from 4 to 6 inches is needed, that the ends should be so situated as to command, and perhaps in some large cases have funnels like those of a large ship, which can be turned so as to command draught.

If the house sewage is to go to sub-soil pipes, or to a house cesspool, or if there is an outside privy, these of themselves may cause soil pollution or air pollution, if in near proximity to the house.

Where the sewage is conducted to a tank like Field's flush tank to be distributed to loose laid pipes undergrounds, two principles are made available. One is that the automatic flush every few hours removes the liquid soon enough, and at the same time scours or cleanses by the force of its motion. The other is by this intermitted flow air and water do alternate purifying service in the pipes, while at the same time the sewage is distributed so few inches underground as to allow of its natural appropriation by the herbage and crops. In the use of this plan, careful but not difficult administration is necessary, in order that the *tank* may be kept in cleanly condition, and not become a cesspool, and that such tillage is used as enables the soil to appropriate the plant food placed within it, thus preventing soil-pollution.

Where a cesspool is or has to be tolerated, there are two methods. The one is to have a cesspool that is made without cemented bottom, or in whole or in part with the sides laid with loose stone or brick, so as to allow all liquids to soak out, carrying with them much organic matter. This

soakage will continue longer if the grease from liquids is separated before discharge into them. The apparent success of this method will largely depend upon the character of the soil. If it is of a loose or gravelly character, so as to admit air and liquids freely, no doubt much of this matter is oxydized or flows off, even where too deep to be reached by the roots of grasses, plants, or trees. But in all cities there is a limit to this process, and it is often fraught with risk in country places. We know of a recent outbreak of typhoid fever, in which, owing to a change of strata at one point, and a dip contrary to the contour of the surface, the sewage found its way around and into the walls of a cellar basement, and so without much odor saturated the building. In other cases unusual heat of a season brings this unappropriated manure which has thus been lodged in the soil into fermentative activity, and administers it to persons instead of to plants. In other cases the *debris* which has been left in the uncleaned cesspool itself takes on degraded decomposition and administers its own attenuated and peculiar poison to a household. The cesspool system, therefore, needs always to be labeled "extra hazardous," although an explosion cannot be warranted each Summer.

The other cesspool system is to have a closed tank or cistern thoroughly cemented, and then to depend on odorless excavating apparatus to empty it at proper intervals. Although these are often crooked or seamed, as a rule they prevent soil pollution, and so are preferable to the uncemented ones. The emptying should, as far as possible, be done in late fall and early spring, although perfection of method is now claimed to justify emptying at any time.

Should cesspools be ventilated or exposed to light? It is claimed by some that either air or light in contact with stagnant filth or befouled liquids tends to excite them to decomposition, and so do not mitigate such concentrated evils.

The other view is that light and air prevent the more degraded forms of decomposition, and so moderate the evil.

No doubt these stagnant pools do provide themselves with a kind of scum or protection which partly seals them from the air, and for a time they are less nocuous than if disturbed. We think the best sustained conclusion is that it is better not to expose them to sunlight, because of sun-heat, but that it is better by means of an open tube or chimney, or a kind of double chimney, to secure circulation of air between the top of the liquid and the ground level. Cesspools should in all cases be as far removed as possible from the dwelling, so that the air about these may not be directly contaminated. As to pipe connections by the methods already indicated, we believe all influx of air from them or from other forms of sewers can be prevented. Having thus pointed out the means for house sewer drains and their immediate connections, we leave it for others to apply the same general principles to more extended sewers.

The paper by Dr. D. F. Lincoln, on The Sanitary Condition of Boarding Schools, was read only by title, and it was announced that it would be published in full in the Sanitary Engineer.

THE HEALTH OF CRIMINAL WOMEN.

An interesting paper on this subject by Dr. Eliza M. Mosher, of the Sherborn Reformatory for Women, was read. The following is an abstract:—

The word criminal, though commonly applied to the inmates of penal institutions, includes in its strict sense, all persons who commit an offense against law, whether convicted or otherwise. In America the number of such persons within the precincts of each state, depends not only upon the amount of its population, the stringency of its laws, and the vigilance of its police force, but also upon the number and size of its cities, and the industries which it carries on. Wherever men and women are herded together, as in the poor and squalid portions of large cities, or great numbers are employed at special work, as in our manufacturing towns, there will be found those influences which make criminals of men, and even more surely of women.

The physical condition of individuals often deteriorates *pari passu* with the moral nature, especially in those cases where intemperance and unchastity are the underlying vices.

To study the diseases of such a class, with the hope of arriving at any but the most general conclusions is a formidable task; and yet, since the inmates of our jails, houses of correction, and prisons are but representatives of a much larger number, who walk our streets, scattering contagion, both moral and physical, and filling our hospitals and dispensaries with patients, it seems worth while to see what can be deduced by a careful examination of a number sufficiently large to represent the class. The object of this paper is, therefore, to ascertain if possible the extent and direction of the influence which a life of crime exerts upon the health of individuals; and, as our observations have been mainly confined to criminal women, we have limited our study to this class. The statistics which we shall present have been taken from the records of the Massachusetts State reformatory prison for women, and extend over a period of four years. During this time 2,196 women were committed to the prison for crimes which, for the sake of

convenience, we have classified under the following heads, viz.: I. Offenses against person and property. II. Offenses against chastity. III. Offenses against public order.

The first class includes all the cases of assault, fraud, larceny, arson, burglary, manslaughter, etc. In this class we find but 310 commitments; the larger number of these women were of foreign birth or parentage; their ages range between 15 and 53 years; nearly all could read and write, and about half were unmarried. Many were sentenced for the first time.

In the second class there were 515 commitments. Of those a majority were natives of the United States and British Provinces; most of them could read and write, and more than half were unmarried.

The third class includes the cases of drunkenness, vagrancy, disturbers of the peace, common railers and brawlers, idle and disorderly persons (which is but another name for drunkenness and unchastity), etc. There were 1,271 such women committed, mainly of foreign birth; among the number were many old women, though the average age was about 30 years. A large number could neither read nor write, and fully three-fourths were married.

It is safe to say, that of the whole number committed during the four years, more than four-fifths were intemperate, and more than three-fourths were unchaste.

Turning now to the hospital record, we find 2,076 cases of illness during this time. Some of these were readmissions of the same individual. A small proportion were infants, which, with the cases recorded under the head of "slight ailments," we have thought best to exclude from our analysis, thus leaving 1,704 cases of illness, of which a careful diagnosis was made, and a record of symptoms and treatment kept. Upon tabulating these, we find syphilis to be the prevailing disease, 305 cases being on record; to these might be added as many more in whom the disease was not in a sufficiently active form to make their admission to the hospital a necessity. With these figures before us, it is safe to conclude that one woman out of every four committed to the prisen was syphilitic. Thirty-two of these cases were found under class I, 100 under class II, and 173 under class III. Of the 100 women sentenced for larceny, who were sick in the hospital during the last two years, 86 were known to be unchaste.

Next in frequency we find cases of alcoholism, of which there were 198; of these 171 were found in class III., 11 and 16 in classes I. and II. respectively; 25 cases of delirium tremens occurred, all but two of which belong in class III. There were 139 cases of tonsilitis, which were very equally distributed among the three classes; 101 of these occurred during the winter of 1878 and '79. Dyspepsia and rheumatism were common ailments, though but 63 cases of each were sufficiently acute in character to need admission to the hospital. The number treated from the dispensary was large. These patients were as widely distributed as the habit of intemperance.

Only 30 well marked cases of insanity were recorded during the four years, and several of these were recommitments to the prison of women who had been transferred to a lunatic hospital during a previous sentence; 20 of the 30 belong under class III.; also 12 of the 15 epileptics who found shelter in the hospital. Paralysis, neuralgia and hysteria prevail most largely in class I., in proportion to the number of commitments; here also are found the greatest number of cases of anœmia and diabetes. Of the seven cases of puerperal fever which occurred, five belong to class II., (offenses against chastity), also eight of the cases of masturbation placed under special treatment. Diseases of the eyes, malarial fever, miscarriages and pulmonary consumption occur in excess also in the second class. Of the last named disease, there were in all 28 cases, in most of which the disease was established when the women were admitted to the prision. But four cases of pneumonia and eight of pleurisy occurred; 21 cases of bronchitis were treated in the hospital; 72 cases of uterine disease were sufficiently severe to need hospital care for a time; a large number of women were able to work, but required medical supervision.

Coming now to the surgical patients, we find but 32 cases in class I. against 65 in class II. and 162 in class III. Abscesses and ulcers occurred in great numbers, as might be expected in a population like this. Rectal diseases also were common. Twenty-four deaths occurred among adults at the prison during the four years; of this number, one died of alcoholism, two of apoplexy, one of brain softening, one of diabetes, one of œdema, one of gangrene of the lungs, one of heart disease, one of entero-colitis, two of peritonitis, five of consumption, one of puerperal fever, two committed suicide, and five died of syphilis. Seventeen of these were found under class III., four under class I. and three under class II. The danger of contagion with so many syphilitics congregated together was great, and complete isolation in many cases was an absolute necessity. If committed for less than two years, they had to be set at liberty before a cure could be perfected, perhaps to become again a source of pollution.

The condition called alcoholism, so often seen in our penal institutions, is one of general depression, following long continued stimulation by intoxicating liquors, with lack of proper food. It is manifested by trembling of the hands and tongue, twitching of the facial muscles, profuse perspirations, an unsteady gait, and incoherence of thought and expression. One woman out of every 11 admitted to the prison was taken into the hospital in this condition. Under a nutritious diet, and rest in bed, these patients soon recovered sufficiently to go to work, but many returned to the

hospital later on, with some other ailment, most often dyspepsia or rheumatism,—those strong allies of intemperance. Some of the cases of delirium tremens were exceedingly violent, but no deaths occurred. Dyspepsia and constipation of the bowels were the two affections of the digestive tract most common among the prisoners, often taxing the skill and patience of the physician more than many severer maladies. Most of the cases of rheumatism were of a chronic character. The small number of cases of pulmonary disease leads us to conclude that affections of the respiratory organs are not a necessary accompaniment of prison life; proper food and clothing, good ventilation, and a fair amount of sunlight, being here, as everywhere, their best preventive. There have been 68 births at the prison; of this number but one mother died, although many were so diseased that their infants died before or shortly after birth. Diseases of the reproductive organs, though common, were not disproportionate to the number of women committed. Among the surgical cases, indolent ulcers, mainly of the leg, were of frequent occurrence, often detaining women in the hospital for weeks who otherwise were able to work. Some of the cases of rectal disease were of long standing, and exceedingly severe in character; while others were so simple as not to need admission to the hospital during treatment. An examination of the foregoing cases leads us to the following conclusions: 1. Intemperance and unchastity are the two vices which fill our penal institutions with women. 2. The influence of these vices is detrimental to health of body, increasing its susceptibility to disease, and lessening its recuperative power. 3. The diseases which follow as a direct result of these vices, are syphilis, alcoholism, dyspepsia, rheumatism, and general anæmia. 4. Morbid conditions of body react upon the moral nature, increasing and perpetuating the tendency to criminality; hence the importance of careful medical supervision, as a reformatory measure. 5. More ample provision should be made in all large cities for the isolation and thorough treatment of venereal patients of both sexes, either by the addition of special wards to the general hospitals, or by the establishment of hospitals exclusively for this class. 6. The women who commit high crimes only, that is, larceny, burglary, arson, manslaughter, etc., possess a more sensitive nervous organization than those who commit offenses against chastity and public order.

After the reading of this paper Mrs. Leonard of Springfield opened the debate on it, by speaking of the general characteristics of criminal women, and what is done for their moral reformation at Sherborn, touching also on the Lancaster industrial school for girls, and what it accomplishes for younger persons of the same class.

A paper on "International Relief in War" was read by Miss Clara Barton, in which the history, the work accomplished, and the objects and aims of the "Association of the Red Cross," an international association for the relief of sufferings by war, pestilence, and famine, and other great national calamities, were set forth in an interesting and scholarly manner.

This paper concluded the series read before the Department of Health.

LeRoy Parker.

EXAMINATION OF PUBLIC BUILDINGS.

STATEMENT PREPARED IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

The Legislature of Michigan in 1881 passed a law, one section of which made it the duty of the boards governing the several State institutions to submit to the State Board of Health and to the State Board of Corrections and Charities all plans for buildings proposed to be built at their several institutions, for examination and recommendations as regards their sanitary character. The section of law which makes this provision is as follows:

SEC. 7. (Act No. 206, Laws of 1881.) That before the board of any charitable, penal, or reformatory institution shall determine on the plan of any building for school purposes, living-rooms, work-rooms, or sleeping-rooms for inmates, or on any system of sewerage, ventilation or heating, which have been authorized by the Legislature to be constructed, such plans shall be submitted to the Board of Corrections and Charities and the State Board of Health for examination and opinion thereon; and the board so submitting such plans shall in its biennial report show to what extent they were approved by the boards so examining them. That it shall be the duty of said State boards to visit said penal, charitable, and reformatory institutions when necessary to make the examinations herein required, and their official expenses necessarily incurred shall be audited by the Board of State Auditors and paid from the general fund.

Under this section the State Board of Health was invited to meet to examine plans for proposed buildings at the State Reform School at Lansing. At this meeting action was also taken on plans for buildings at the State House of Correction and Reformatory at Ionia, and on some improvements to be made at the State Institution for the Blind, at Lansing, as will be seen by the following minutes of the session:—

MINUTES OF THE JOINT MEETING OF THE STATE BOARD OF HEALTH AND THE STATE BOARD OF CORRECTIONS AND CHARITIES, AT THE STATE REFORM SCHOOL, LANSING, JUNE 22, 1882.

The State Board of Health and the State Board of Corrections and Charities having been invited to meet and examine plans of buildings proposed to be erected for the Reform School at Lansing under Sec. 7, Act 206, Laws 1881, said Boards met at State Reform School, Lansing, June 22, at 10 A. M. Present, Hon. LeRoy Parker, J. H. Kellogg, M. D., John Avery, M. D., and Henry B. Baker, M. D., of Board of Health; and George D. Gillespie, D. D., Hon. John J. Wheeler, and W. J. Baxter, Secretary of Board of Corrections and Charities.

On motion, it was resolved by the two Boards to act as a joint board in examinations of plans of buildings submitted, and George D. Gillespie, D. D., was, on motion, appointed chairman, and W. J. Baxter, Secretary, of joint meeting.

PLANS FOR WORKSHOPS AT THE STATE HOUSE OF CORRECTION, IONIA.

Plans for new shops in course of erection at Ionia having been sent to each of said Boards previous to this meeting, the same were examined, together with

a number of communications explaining the neglect to present them at the proper time, and after full consideration the following resolutions were offered by Dr. Baker, and after discussion adopted. viz.:—

Resolved, That the plans for workshops at the State House of Correction and Reformatory at Ionia, submitted to these Boards for examination under Sec. 7, Act 206, Laws 1881, show no design for heating, ventilation, sewerage or drainage, no provision for escape in case of fire, nor any fact as to the safety of the walls, nor the purposes for which the same are to be used; and the plans are noticeable for an entire absence of any plan for any sanitary appliance;

Resolved, That a committee consisting of George D. Gillespie, D.D., of the Board of Corrections and Charities, and John Avery, M. D., of the Board of Health, be appointed to visit said Reformatory, examine the buildings with special reference to sanitary arrangements and all matters referred to in the preceding resolution; and, if the plans on inspection of the buildings are found defective, to endeavor to secure suitable action in remedying such defects on the part of the proper authorities, and to report their findings and doings to their respective Boards.*

INPROVEMENTS AT THE STATE INSTITUTION FOR THE BLIND, LANSING.

Several communications were submitted to the joint Boards in relation to improvements to be made at the School for the Blind at Lansing, and there being some question as to whether these improvements were of a character requiring the submission to these Boards under Sec. 7, Act 206, Laws 1881, on motion, Geo. D. Gillespie, D. D., of the Board of Corrections and Charities, and Hon. LeRoy Parker of the Board of Health were appointed a committee to examine and report what, if any, action should be taken by these Boards in the premises.

Said committee subsequently reported that the improvements contemplated at the School for the Blind were not of a nature requiring any submission to or action on the part of these Boards.

The report was accepted and adopted.

PROPOSED NEW BUILDINGS AT STATE REFORM SCHOOL, LANSING.

The plans for new buildings proposed to be erected for the Reform School at Lansing having been submitted and carefully examined in the presence of, and assisted by the explanations of, the architect, the following resolutions were offered by J. H. Kellogg, M. D., which, after full discussion, were adopted, viz.:

Resolved, That in our opinion the plans for a new school and dormitory for use of the Reform School, presented to us for examination, are, from a sanitary point of view, in many respects greatly superior to most others of our public buildings. We would, however, respectfully offer the following suggestions:

1. The two lateral halves of the building should be supplied with shafts for the exit of foul air, which are wholly separate from and independent of each other.

2. It is also essential that the foul-air shafts of the several floors should be separate and independent.

3. The sectional area of the foul-air shafts throughout the building should be very much greater than shown in the plans, and all foul-air shafts should be heated sufficiently to insure adequate draft.

On motion a committee consisting of Dr. Kellogg, of the Board of Health, and Dr. Van Deusen, of the Board of Corrections and Charities, was appointed to confer with the Board of Control of the Reform School in relation to changes recommended, in case the Board of Control of said Reform School should desire any further conference or suggestions in relation thereto.

On motion it was further resolved that when the plans for the proposed building for a residence for the family of the Superintendent of the Reform School shall have been perfected, they may be submitted to said joint committee, who shall examine the same, and as early thereafter as practicable report to the Presidents of their respective Boards.

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* Dr. Avery's report may be seen on page 343 of this volume.

The action of the Joint Boards in relation to the plans for the school room and dormitory for the Reform School having been communicated to Mr. Gower, Superintendent of said Reform School, he, on behalf of the Board of Control of said Reform School, requested the joint committee appointed for the purpose to prepare definite suggestions and detailed statements of the changes desired by the Joint Boards in foul-air flues, and any other suggested changes not already specified with sufficient distinctness to enable the architect to make the same without further conference. The committee were instructed so to act.

On motion, the Joint Board then adjourned.

W. J. BAXTER, *Secretary.*

REPORT OF COMMITTEE ON NEW DOUBLE COTTAGE AT THE STATE REFORM SCHOOL.

In accordance with the instructions of the joint meeting, the committee examined the plans as requested, and the following report contains their recommendations in detail:—

To the Honorable Board of Control of the State Reform School at Lansing:—

The undersigned, having been appointed by the State Boards of Health and of Corrections and Charities at a joint session of those Boards June 22, as a committee to make suggestions respecting necessary modifications in the plans for the new double cottage about to be erected by you, in order to perfect its sanitary arrangements, especially those for heating and ventilating, after having given the matter as careful consideration as the time and circumstances would permit, respectfully submit the following suggestions:—

1. The single central ventilating shaft of three square feet sectional area with openings upon each floor, should be replaced by six separate shafts, one for each school-room and each dormitory, the size of each of the two shafts for the school-rooms to be not less than four square feet in sectional area, and of each of the four ventilating shafts for the dormitories not less than two and one-half square feet in sectional area.

2. Each shaft should be sufficiently heated by steam pipe, gas flames, or otherwise, to secure a constant upward current at the rate of not less than eight feet per second.

3. The two single ventilating shafts which are connected with the keeper's sitting and sleeping rooms and with the upper dormitory as shown in the plans, should be replaced by four separate flues, so placed as to be warmed by the hot air ducts, one for each of the keeper's rooms in the first and second stories.

4. The provision for the ingress of pure warm air should be considerably increased in each of the several rooms. Registers should be placed in the floor of the school rooms, communicating directly with the heating coils in the basement, and the number or size of warm air ducts supplying the dormitories should be doubled.

5. The size of registers leading into the foul-air shafts should be such as to present no impediment to the draft, and the shafts should be protected at the top by some approved form of cap to prevent dampness arising from the entrance of rain or snow.

6. A pipe should be connected with the drain a short distance from the building, and carried to a few feet above the surface, for the purpose of allowing a circulation of air in the drain by establishing a current down the short

pipe and up the rain-water leaders, and also to prevent a backward pressure of gas into the house in case of heavy rains.

7. Proper fire escapes should be provided.

In making the above suggestions the committee have considered the fact that the contract for the building had already been let, and that on this account as few and as slight changes as possible should be made, and that a minimum of expense should be incurred in making such changes as seemed to be absolutely essential to the physical well-being of the prospective occupants of the building. If the plans could have been examined at a somewhat earlier date, several other suggestions might have been made, such as greater provision for light in the school-room, ventilation of the basement, etc.

The changes suggested are not expected to secure the highest results attainable in heating and ventilation; but it is believed they will secure reasonably satisfactory results, since the various rooms are never to be all occupied at the same time, and are to be vacant during the greater portion of the twenty-four hours. It is also believed that the modifications recommended may be made with very little increase of expense.

Respectfully submitted. J. H. KELLOGG,
E. H. VAN DEUSEN.

REPORT ON THE PLANS FOR THE SUPERINTENDENT'S COTTAGE AT THE STATE REFORM SCHOOL, AT LANSING.

As requested by the joint meeting, the plans for the Superintendent's cottage were examined by the committee when presented, and the following is the report of Dr. Kellogg, of that committee:—

To the President of the State Board of Health of Michigan:—The committee appointed at a joint meeting of the State Boards of Health and of Charities and Corrections, to consider the plans for a superintendent's cottage, would respectfully submit the following as their report:—

On making a careful examination of the plans we were pleased to find ample provision of the most approved sort for ventilation and heating; but the arrangement of the privy as shown in the plans is decidedly objectionable, for the following reasons:—

1. The wall of the vault is common with that of the basement, there being only a brick partition between the vault and the basement.

2. As the privy is to be managed as an earth-closet, its location immediately adjoining the house, and especially its inclosure under the same roof with the wood-shed, renders it reasonably certain that it will within a short time after being put to use become a serious nuisance and in the highest degree objectionable from a sanitary point of view.

The committee offered to the architect and the superintendent suggestions for such changes as seemed to them to be required to remedy the difficulty, which need not be specified in this report.

We would further suggest that the house-drain should be ventilated by means of a short pipe tapping the drain between the house service-pipe and the trap, which will secure a change of air in the pipe and will prevent back-pressure of gases through sinks and wash-basins during heavy rains, when the usual upward current will be likely to be reversed.

Respectfully submitted,
J. H. KELLOGG,
Member of the Committee from the State Board of Health.

WORKSHOPS AT THE STATE HOUSE OF CORRECTION, IONIA.

The committee appointed by the joint meeting,* to visit and inspect the shops in course of construction at the State House of Correction and Reformatory, did so, and the following is their report:

On Friday, the 30th day of June, in obedience to instructions from this Board, and in company with Bishop George D. Gillespie, President of the State Board of Corrections and Charities, your committee visited the State House of Correction at Ionia, to confer with the authorities of that institution in reference to plans for work-shops, which had been submitted to the joint Boards of Health and Corrections and Charities.

We found the building in process of construction,—the walls being up and the roof ready for the slate. It is 135 feet long by 50 feet wide, and two stories above the basement, and is designed to be used as a tub and pail factory. It appears to be substantially built; the work being almost entirely done by inmates of the prison. The walls of the basement are of stone gathered mostly from the farm connected with the institution, are two feet thick and nine feet high in the clear. The walls above the basement are of brick; the first story sixteen inches thick and sixteen feet high,—the second story, twelve inches thick and twelve feet high. The building is heated by steam, and as designed there is no provision for ventilation other than through the doors and windows. Arrangements for drainage and sewerage appear to be satisfactory.

Your committee advised the construction of four double ventilating-flues, two upon each side of the building, with registers for foul air upon the first and second floors; these flues to be heated by means of steam pipes. This would give four ventilating-flues for each floor, two upon each side,—each flue to be 12x24 inches in the clear. Mr. Watkins, the Superintendent, very readily assented to the suggestions of your committee, and said that they should be fully carried out.

The same defect in ventilation, or rather want of it, was found to exist in both the large shops now in use,—one as a cigar factory, the other for the manufacture of boots and shoes. These shops are similar in construction to the one now being built, and can be ventilated at small cost, in the same manner as suggested for the tub and pail shops. The Superintendent fully recognized the necessity of ventilation in these shops, and said the recommendations of your committee should be complied with before winter sets in. All of these shops are well supplied with windows upon each side, and during warm weather, when they can be open, afford a good circulation of air through them.

Water-closets for day use are constructed in one end of each shop,—each has a good trap, and is well supplied with water for flushing. The defect here is, there is no ventilation of the sewer-pipe between the trap and the closet. Your committee pointed out this defect, and received assurances that it should be remedied; and finally your committee is pleased to acknowledge itself under obligations to Mr. Watkins for the very courteous manner it was received and entertained, and for the very ready assent he gave to its recommendations. All of which is respectfully submitted.

JNO. AVERY,
Member of the Committee from the State Board of Health.

* An account of this joint meeting may be seen on pages 339–340 of this volume.

DIPHTHERIA IN THE MICHIGAN ASYLUM FOR THE INSANE, AT KALAMAZOO.

BY W. L. WORCESTER, M. D., ASSISTANT PHYSICIAN TO THE ASYLUM.

Two cases of diphtheria occurred in this institution during the autumn of 1880, *the first in its history*. No more occurred until the latter part of December, when it broke out almost simultaneously at both male and female departments and at the house of the engineer, and continued epidemic during the remainder of the winter and spring. As our population is rather more under control than the community at large, it may be of interest to make a somewhat detailed study of the circumstances of the epidemic, with reference to the origin and spread of the disease.

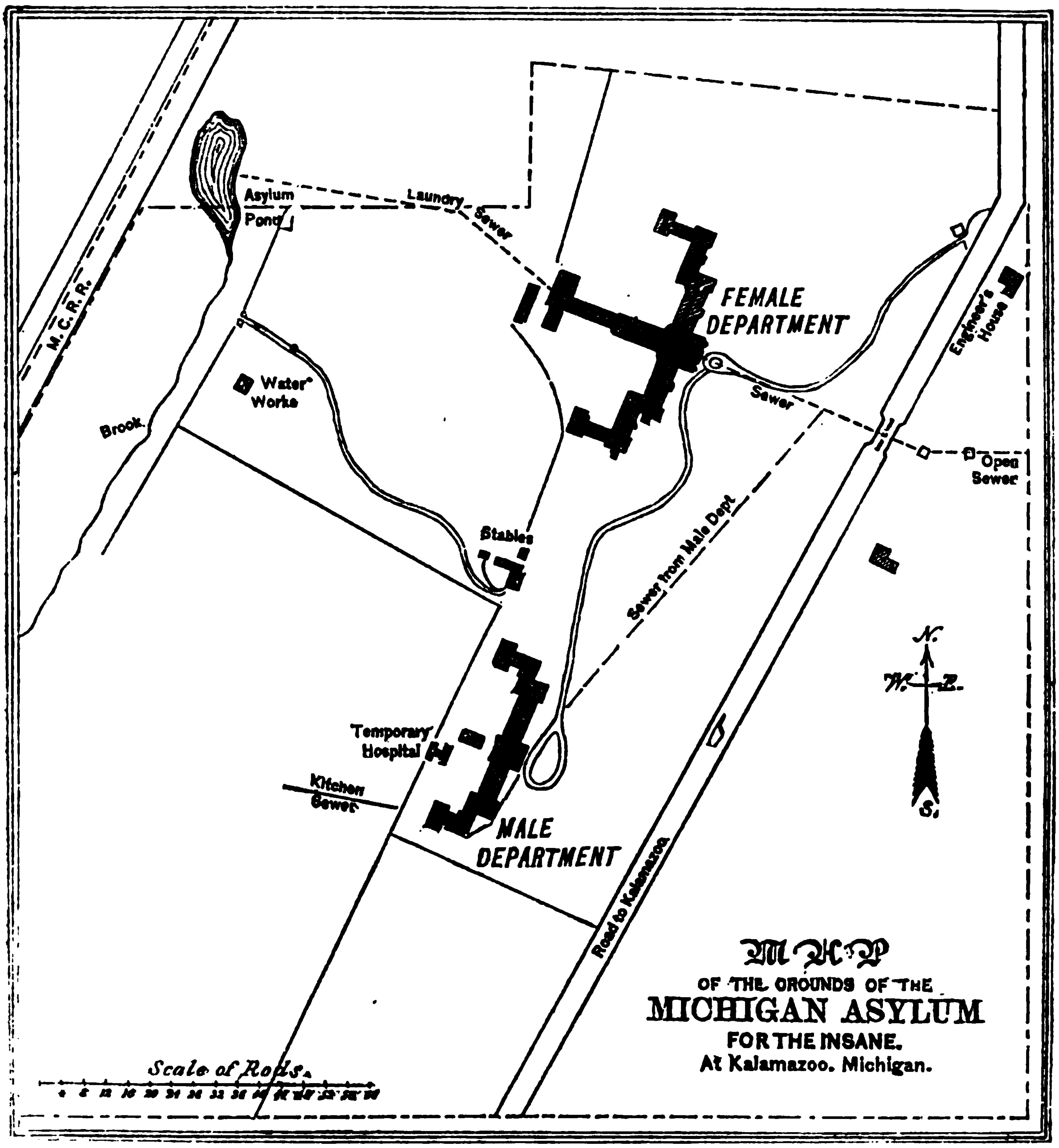
The asylum is situated on elevated ground, with gravelly subsoil, about 100 feet above the level of ground-water. The male and female departments are in separate buildings, about forty rods apart. Each building is composed of a central building, containing the business offices, with the lodgings of the officers and persons employed in the kitchen, laundry, etc., and two wings containing the wards for patients. The water-supply is drawn from a well 22 feet deep, situated about 57 rods to the west of the asylum buildings, and about 96 feet below the level on which they stand. The situation of the water-works, and of other points mentioned, will be seen by the map on page 345. The sewage, with the exception of that from the kitchen at the male department and the laundry at the rear of the female department, is conducted by closed sewers to a point about forty rods east of the female department, where the solid portions are deposited in a tank and the fluid part is conducted away by an open sewer or ditch. The other sewers mentioned, the course of which will be seen from the map, are only covered for a short distance.

The stables for horses and cattle are situated between and a little to the rear of the Asylum buildings; the ground slopes from them towards the west.

The amount of water drawn from the well averages about 50,000 gallons per diem. Its sensible qualities are excellent, and chemical tests fail to show the presence of any appreciable amount of organic matter.

During the prevalence of the epidemic, the sewage arrangements within the buildings were carefully inspected. While there was reason to think that the traps might not, in all cases, be sufficient to prevent the escape of gas, the plumbing was found to be in good order. With the exception of mild forms of influenza, bowel complaints, and, at times, malarial fever, the institution

has been almost entirely free from epidemic disorders of every sort, and the death-rate has been lower than the average in similar institutions. Nothing unusual was discovered in the general sanitary condition of either building at the time of the epidemic.



MALE DEPARTMENT.

The first person attacked, a young man aged 24, was admitted to the asylum on October 16, 1880, suffering from acute mania. I am unable to learn that he had been in any way exposed to contagion before leaving home. He reached Kalamazoo in the evening, and spent the night in jail. I am informed by Dr. Upjohn, at that time jail-physician, that there had been several cases of sore throat at the jail, but none which he had considered diphtheritic. He was noticed to be ailing on the evening of October 20, but did not complain of his throat, and the nature of the disease was not discovered until noon of the 23d, at which time both tonsils were covered with a thick mem-

brane. He was at the time in hall "H," on the second floor at the southern extremity of the building, in the room marked "A" on the ground plan of the male department, on page 347. There were then, in the same hall, twenty other patients, ranging in age from eleven to fifty-five years, and three attendants. He had not been confined to bed, and had been going about freely amongst the other patients. He was now isolated in the room marked X on the plan, and usually occupied by patients on hall "G" on the same floor, and was cared for by attendants from hall "H." The membrane had already invaded the larynx; the patient was extremely refractory, refusing food and medicine, and symptoms of exhaustion soon developed. He died on the evening of October 25.

In this case, as in all others, the excreta was disinfected, either with copperas or Labaracque's solution; clothing worn during the illness either destroyed or disinfected by boiling, and the rooms occupied thoroughly fumigated with sulphur, except as stated in first paragraph on page 348, relative to a room in hall "H." No other case occurred among those who were at that time on hall "H."

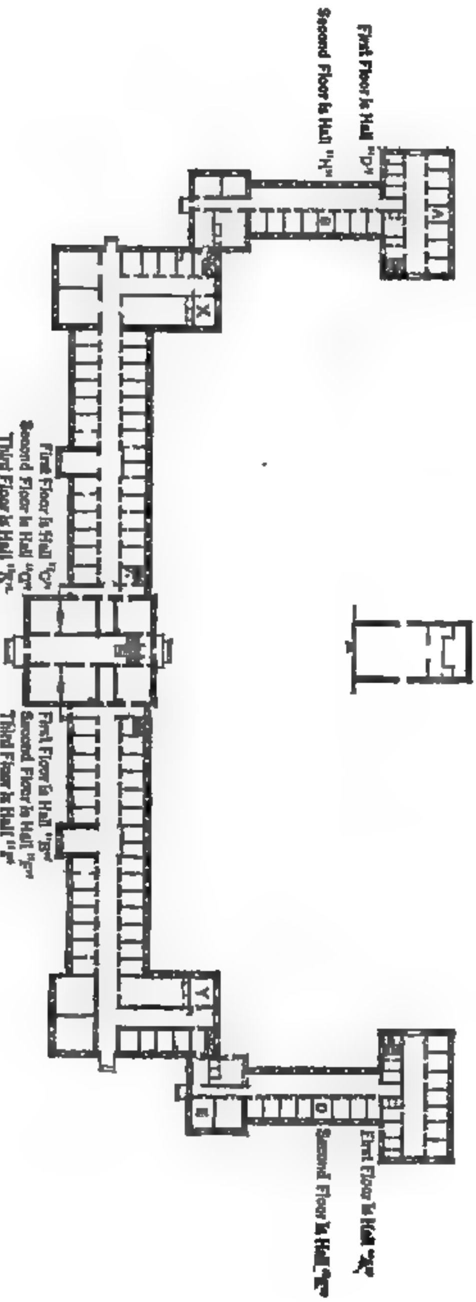
The second case occurred on hall "D," immediately below hall "H," in the room marked "B" on the plan on page 347. The patient, L. D., aged 55, first complained of his throat on the evening of November 4, but it appeared on inquiry that he had not felt well for a day or two before. There was, at the time attention was called to him, abundant development of membrane on the tonsils and pharynx. The same measures were adopted in this as in the preceding case. He made a good recovery, with exception of some paralysis of the pharyngeal muscles, which lasted for several months. After his throat appeared entirely well, his clothing was changed, his person carefully disinfected, and he was allowed to return to the hall. No other cases occurred on hall "D." It seems certain that this patient had not come in contact with case No. 1 at any time after October 20; he may have met him out of doors before that time. In the latter part of November, halls "D" and "H" were thoroughly cleaned and whitewashed, and the wood-work painted.

The next case in the male department was discovered December 23. As already stated, the disease appeared about the same time in the female department (about Dec. 23) and at the house of the engineer (about Dec. 13). As, however, the contagion, if any, in those cases would seem to have come from other sources, and as the cases in the male department were more directly under my own observation, I will dispose of them before taking up the others.

Case 3. A. Mc. G., a servant girl employed in the kitchen, aged 19, complained, December 23, of sore throat, and was found to have commencing deposit on the tonsils. The case was a mild one, resulting in recovery. She was nursed by her room-mate, a girl of about her own age. No other cases occurred among the *kitchen-employés*. No evidence of contagion from any source could be obtained in this case. I am unable to remember positively how the remnants of food from the rooms of the first and second cases were disposed of, and the attendants who nursed those cases are no longer here. My impression is that it was thrown into the stools of halls "G" and "C" respectively, with the disinfected excreta. It may have been, in some cases, put with the remnants from the dining-rooms of those halls.

Case 4. F. F., an attendant, aged about 25, employed on hall "C," was attacked on the evening of January 9, 1881. No membrane could be discovered at that time, but careful watch was kept, and as soon as it made its

appearance he was isolated in the room marked "X," and kept there until his throat was entirely well. The case was one of moderate severity. He had attended patients occupying the room in which case 2 was treated.



MALE DEPARTMENT, ASYLUM FOR THE INSANE, KALAMAZOO, MICHIGAN.

A. Room in which case No. 1 was taken sick.
B. Room in which case No. 2 was taken sick.
D. Room in which case No. 8 was taken sick.
E. Room in which case No. 10 was taken sick.
X. Room where case No. 1 was treated.
Y. Room where case No. 6 was treated.

The building is part two stories high and part three stories. On each story of each division is a hall, or ward, which are lettered A, B, C, etc.

CASE 5. W. F. C., a patient, aged 26, was transferred January 3 from hall "G" to hall "H," (probably room "A,") where case 1 originated. The room had been washed with Labaracque's solution and whitewashed, but had not been fumigated. He was discovered to have diphtheria January 9.* The case was a mild one. The same precautions were taken as in the preceding cases. No further cases occurred on hall "H," and none on hall "G."

CASE 6. R. S., patient, aged 26, attacked January 13 in room "D," on hall "E," at the extreme northern end of the building. He had had no communication with either of the other cases. Recovered. Treated in room marked "Y" on plan, connected with hall "F." There were at the time, twenty other patients and three attendants on hall "E." One of the latter (case 9), suffered from the disease.

CASE 7. L. P., matron in male department. Attacked January 24. Had not come in contact with any of the preceding cases except, possibly, case 3; *Ate at same table with the physicians.* She was removed for treatment to the chapel at the female department, then used as a hospital. Mild case; recovered.

About this time an outbuilding was fitted up for hospital purposes, and the following cases were treated there. The nurse who was employed there was not allowed to go on the wards without changing his clothing. The physicians did not change their clothing, but put on long dusters before making their visits to the hospital.

CASE 8. C. T., patient, aged 17, was admitted to hall "C," where case 4 originated, January 7, 1881; attacked January 29. Mild case; recovery. During his illness he was visited by his mother, who, after being fully warned of the danger, was allowed to spend the greater part of the day with him. She wrote, later, that she had suffered from the disease after reaching home.

CASE 9. J. D., attendant, aged 22. Assisted in caring for case 6. Attacked February 10, 1881. Mild case; recovery. No other cases on hall "E."

CASE 10. P. W., aged 12, patient in room "E" hall "A," ground floor, at extreme north of the building. Nature of disease discovered February 20, but he had been ailing for two days previously. The case was a severe one, but he eventually recovered. There were twenty-three other patients and three attendants on the hall. One other case occurred (No. 15), which will be given later.

CASE 11. L. R., patient, aged 38; admitted on hall "C" (see cases 3 and 8), February 8, 1881; attacked February 28. Mild case; recovery. There were, at the time, forty-two patients and four attendants on hall "C." No further cases occurred on that hall.

CASE 12. G. S., attendant, hall "K," south wing, third floor. Attacked March 20. No history of direct exposure could be obtained. Mild case; recovery.

CASE 13. C. E. B., patient, aged 21, on hall "K." Discovered to have diphtheria March 23, but had evidently been suffering from it for two or three days. The case was a severe one from the start, and the patient very refractory, making a violent resistance to everything that was done for him. Died April 2.

CASE 14. T. B., patient, hall "K," aged 50. Attacked March 24. Mild case; recovery. There were, at that time, forty-seven patients and four attendants on hall "K." No further cases occurred on that hall.

CASE 15. H. D., attendant, hall "A" (see case 10.) The first symptoms were noticed March 26. The case was mild at the commencement, but after the tonsils had almost entirely cleared, the larynx was attacked, and at one

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*Assuming that he contracted the disease from the room, it would seem that the period of incubation did not exceed six days.

time the laryngoscope showed the vocal chords and nearly the whole interior of the larynx to be covered with membrane. No more cases occurred in the male department until August 26, 1881.

CASE 16. W. M., a greatly demented patient on Hall "J," was discovered August 26 to have swelling of the glands of the neck, and to be much prostrated. On examining the throat a diphtheritic deposit was found on the left tonsil. The swelling rapidly increased, and symptoms of collapse soon developed. He died the next morning. There were, at the time, forty-five patients and four attendants on the hall. No cases have since occurred in the building.

TABLE I.—*Showing the number of cases of Diphtheria, the dates of attack, and the location of the cases in the Male Department, of the Asylum for the Insane, Kalamazoo.*

		NUMBER AND LOCATION OF CASES.											
		North Wing.					Centre.		South Wing.				
		1st Floor.		2d Floor.		3d Floor.	2d Floor.	3d Floor.	1st Floor.		2d Floor.		3d Floor.
		HALL		HALL		Hall			HALL		HALL		Hall
No. of Case.	Date of Attack.	A.	B.	E.	F.	J.			C.	D.	G.	H.	K.
1	October 20, 1880.											1	
2	November 4.									1			
3	December 23.							1					
4	January 8, 1881.								1				
5	" 9.											1	
6	" 13.			1									
7	" 24.						1						
8	" 29.								1				
9	February 10.			1									
10	" 20.	1											
11	" 28.								1				
12	March 20.												1
13	" 23.												1
14	" 24.												1
15	" 26.	1											
16	August 26.					1							
	Total.	2		2		1	1	1	3	1		2	3

The annexed table, "I," will show the dates and locations of the above cases. It will be observed that the largest number of cases on any one ward was three, while only three of the ten wards remained exempt. *No cases have been included in the foregoing account in which a distinct false membrane could*

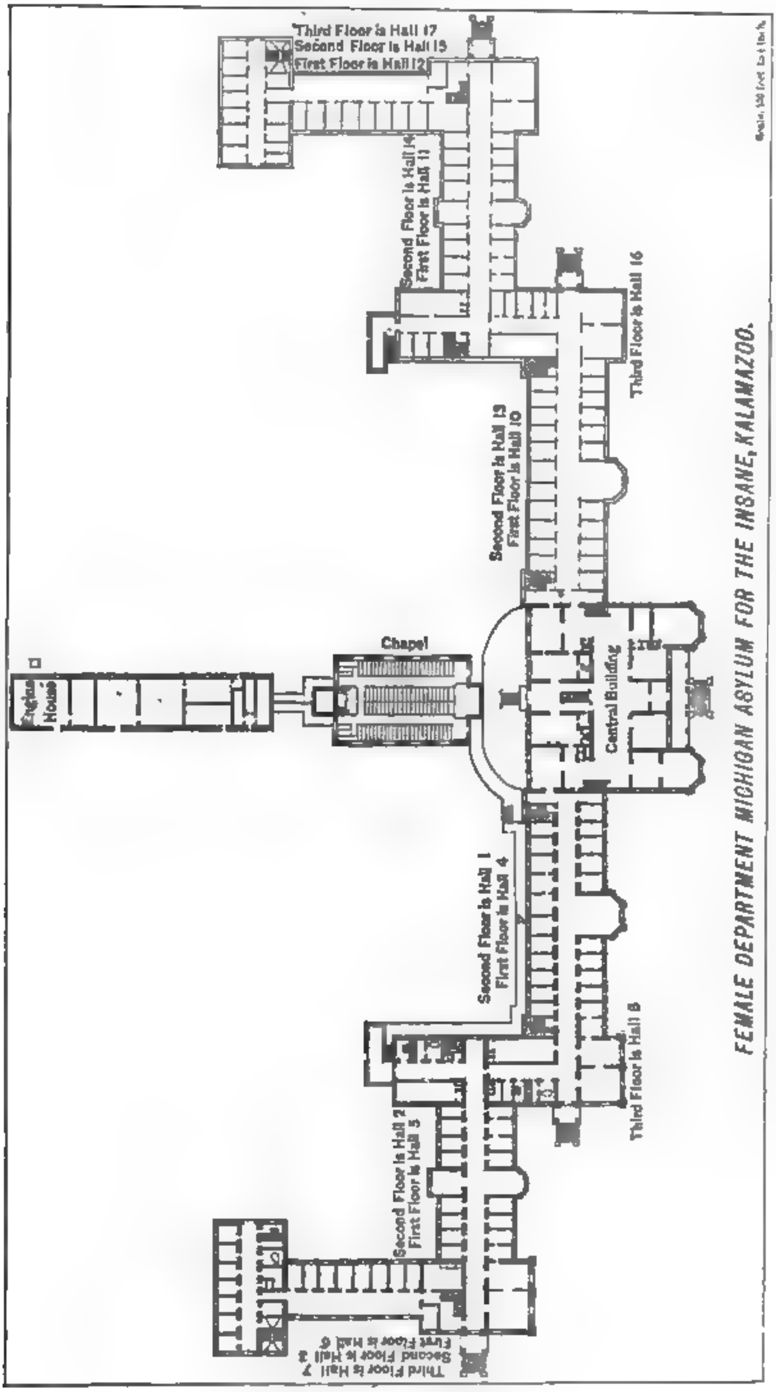
not be discovered. During the progress of the epidemic very many cases of sore throat, accompanied with feverish symptoms, occurred in both departments. *

While the symptoms, in many of these cases, were very similar to those in mild cases of diphtheria, no difference could be discovered between them and cases which have been frequent both before and since the epidemic, and *no attempt was made to isolate the patients.* If such cases are to be considered as diphtheritic and capable of communicating the disease, probably *very few, if any persons in the building escaped exposure.* All were, also, about equally exposed to whatever contagion might be communicated by the physicians in attendance upon the sick. If, on the other hand, we consider merely the possibility of contagion from persons suffering from the disease in a well-marked form, it would seem to have played but a small part. Such exposure can be excluded in cases 2, 5, 6, 10, and 16, and in cases 1, 3, 4, 7 and 12, it must have occurred, if at all, outside of the asylum. In the remaining six cases, if we are to suppose such to have been the origin of the disease, the period of incubation must have varied from three days (case 13), to thirty-four days (case 15). No cases occurred from February 28 to March 20. Thirteen persons, in all, were engaged in nursing and attending on the various patients sick with diphtheria, of whom only one (case 9) contracted the disease (although they took their food in the rooms of the patients they were nursing) after an interval of more than two weeks, while five cases occurred among forty-seven other attendants and employés. In case 16 it is difficult to imagine any possible source of contagion. The patient had not been on any other hall; no case of diphtheria had occurred on that hall; none had occurred in the building for five months, and none in the institution for nearly three months. In the meantime the building had been thoroughly cleaned, and the clothing worn during the prevalence of the epidemic laid away.

FEMALE DEPARTMENT.

Forty-six cases occurred at the female department. Table II., taken in connection with the ground-plan of the building on page 351, will show the principal points in regard to most of the cases. A few of them call for special remark.

[*Such mild cases can probably communicate diphtheria to other persons, and should not be omitted from consideration in studying the spread of the disease, even though only thus referred to in the account. Dr. Worcester's view of this, is given in the last paragraph of this article, on page 355.—H. B. B., Sec. S. B. of H.]



The building is in part three stories, and in part two stories; in each division, on each floor is a "hall," or ward, numbered 1, 2, 3, 4, etc.

TABLE II.—*Showing the Number of cases of Diphtheria, the date of attack, and the location, in the Female Department of the Asylum for the Insane, at Kalamazoo.*

No. of the Case.	Date of Attack. 1880–1881.	North Wing, 1st Floor, Hall 12	North Wing, 1st Floor, Hall 11	North Wing, 1st Floor, Hall 10	North Wing, 2d Floor, Hall 15	North Wing, 2d Floor, Hall 14	North Wing, 2d Floor, Hall 13	North Wing, 3d Floor, Hall 17	North Wing, 3d Floor, Hall 16	Centre.	Engine House.	South Wing, 1st Floor, Hall 4	South Wing, 1st Floor, Hall 5	South Wing, 1st Floor, Hall 6	South Wing, 2d Floor, Hall 1	South Wing, 2d Floor, Hall 2	South Wing, 2d Floor, Hall 3	South Wing, 3d Floor, Hall 8	South Wing, 3d Floor, Hall 7	REMARKS.
1	Dec. 23			1																Patient, aged 44; mild case; recovered.
2	Jan. 1									1										Servant girl; mild case; recovered.
3	" 3				1															Patient, aged 40; mild case; recovered.
4	" 4						1													Patient, aged 36; mild case; recovered.
5	" 7												1							Patient, aged 55; mild case; recovered.
6	" 9										1									Fireman; mild case; recovered.
7	" 12					1														Attendant; moderately severe case; recovered.
8	" 19					1														Patient, aged 30; severe case; recovered.
9	" 20																1			Patient, aged 22; moderately severe case; recovered.
10	" 24										1									Fireman; mild case; recovered.
11	" 29						1													Patient, aged 27; mild case; recovered.
12	Feb. 1					1														Patient, aged 25; mild case; recovered
13	" 2					1														Patient, aged 34; died March 28, of pneumonia.
14	" 2															1				Attendant; moderately severe case; recovered.
15	" 8					1														Patient, aged 26; died Feb. 9.
16	" 10									1										Kitchen boy; moderately severe; recovered.
17	" 11					1														Attendant; moderately severe case; recovered.
18	" 16			1																Patient, aged 18; mild case; recovered.
19	" 17	1																		Patient, aged 26; died Feb. 28.
20	" 21									1										Servant girl; severe case; recovered.
21	" 22											1								Patient, aged 35; mild case; recovered.
22	" 25								1											Patient, aged 24; mild case; recovered.
23	" 28											1								Attendant; mild case; recovered.
24	March 2									1										Laundress; mild case, recovered.
25	" 25														1					Patient, aged 17; mild case; recovered.
26	" 25					1														Patient, aged 26; moderately revere case; recovered.
27	" 26																		1	Attendant; doubtful case.
28	" 28					1														Patient, aged 24; severe case; died May 30.
29	" 29					1														Second attack (see case 12); moderately severe; recovered.
30	" 29					1														Patient, aged 45; mild case; recovered.
31	" 30		1																	Patient, aged 45; mild case; recovered.
32	" 30		1																	Attendant; moderately severe case, recovered.
33	" 31			1																Patient, aged 22; severe case; recovered

TABLE II.—*Continued.*

No. of the Case.	Date of Attack. 1881.	Number and Location of Cases. North Wing. 1st Floor. Hall.			2d Floor. Hall.			3d Floor. Hall.		Centre.	Engine House.	South Wing. 1st Floor. Hall.			2d Floor. Hall.			3d Floor. Hall.		REMARKS.
		12	11	10	15	14	13	17	16			4	5	6	1	2	3	8	7	
34	April 5..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	Patient, aged 23; mild case; recovered.
35	" 6..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	Patient, aged 14; mild case, recovered.
36	" 7..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Attendant; mild case; recovered.
37	" 8..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	Servant girl; mild case; recovered.
38	" 13..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Patient, aged 44; doubtful case.
39	" 13..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Patient, aged 45; moderately severe case; recovered.
40	" 13..	..	1	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	Patient, aged 38; mild case; recovered.
41	" 15..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	Kitchen hand; doubtful case.
42	" 24..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	Attendant; mild case, recovered.
43	May 26..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	Attendant; mild case; recovered.
44	" 26..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	Kitchen hand; mild case; recovered
45	" 27..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Patient, aged 40; mild case; recovered
46	June 9..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	Physician; mild case; recovered.
	Totals...	1	5	4	2	13	3	..	1	8	2	2	1	..	1	1	2	..	1	

Case 1. E. H., patient, on hall 10. On December 18, four days previous to the attack, a young woman and little girl, from a house in the village in which there was a case of diphtheria, visited the hall, and this patient held the child in her lap. [Assuming that the disease was brought by the woman and little girl, the period of incubation was four days.—H. B. B., Sec. S. B. of H.]

Case 2. No source of contagion is known in this case.

Case 3 had been in contact with the attendant who had nursed case 1.

Case 5. As soon as the nature of case 1 was ascertained, all passing of atttendants or patients between the two wings of the building was prohibited. This case, however, occurred upon the south wing. No source of contagion known. The physician in charge of the north wing did not go on the south wing.

Case 6. No source of contagion known.*

The foregoing cases were treated in their rooms. At this time the chapel was fitted up as an hospital, and all subsequent cases were treated there with exception of the male employés, who were sent to the hospital at the male department.

Case 13. This patient's throat got entirely well, but she remained very much prostrated and succumbed to an attack of pneumonia, March 28.

*[By referring to Table II, case 6 is seen to be a fireman, at the engine house, taken sick Jan. 9; and as by the first paragraph under the sub-head "Engineer's House" it appears that on Dec. 20 there were three children sick with diphtheria at the house of the engineer, it does not seem difficult to imagine what may have been the source of the contagion in case 6.—H. B. B., Sec. B. of H.]

CASE 18. Attacked the day after her admission to the asylum.

CASE 28. This patient was left with the muscles of the throat paralyzed to a great extent. She was fed entirely on liquid food, but on May 30 seized some potato from the plate of another patient and choked herself in the attempt to swallow it. Attempts at resuscitation were unsuccessful.

CASE 46, was Dr. Halsey L. Wood, the physician in charge of the north wing of the building. He had charge of the hospital at the female department during nearly the whole time of the epidemic.

It will be noticed that twenty-seven of the forty-six cases were on the north wing, ten in the centre, and only nine in the south wing. This suggests the question whether the difference is due, to any extent, to the fact that *Dr. Wood, who attended nearly all the cases at the female department, had charge of the north wing.*

No cases occurred from March 2 to March 23, a period nearly coinciding with that (February 28 to March 20) during which the male department was exempt. After this respite, the disease broke out with renewed severity, three cases occurring on as many different halls on the first two days, and nine within a week. There was another still longer period of exemption, from April 24 to May 26, on which day two cases were discovered, and another on the 27th, all in different parts of the building. Here, as at the male department, a strikingly large proportion of the cases—16 out of 46—occurred among attendants and other employés. Those who attended on the sick did not seem more exposed to attacks of the disease than others. With exception of the case of Dr. Wood, already mentioned, only one case (No. 17) seems attributable to any such cause.

It should be mentioned, in this connection, that a gentleman who was at the female department, on business, from February 2 to February 8, wrote us that he suffered from an attack of diphtheria shortly after leaving. While at the asylum he stayed in the centre building, and took his meals with the physicians.

ENGINEER'S HOUSE.

On December 20, 1880, Dr. H. O. Hitchcock was called to the house of our engineer (see plan of grounds on page 345), where he found three children suffering with diphtheria. *One had been ill about a week;** another about five days, and the third was just commencing to develop membrane. A fourth child was attacked on December 25. The second case attacked proved fatal on December 29. The eldest of the above-mentioned children was 15 years of age. The parents and older children escaped. The principal point of interest in regard to these cases is their near coincidence, in point of time, with the outbreak of the disease at both the asylum buildings, suggesting the possibility of some common cause. There seems no reason to suppose a direct connection by contagion, between these cases and any of those at the asylum, and Dr. Hitchcock was unable to learn of any probable source of contagion. The children were attending school at the time.†

I have endeavored, in the foregoing statement, to set forth all facts which seemed likely to throw light upon the spread of the disease. Although there seems no reasonable doubt that diphtheria is, to a certain extent, contagious,

* Taken sick about Dec. 13.

† [Diphtheria was reported present in Kalamazoo for the week ending Saturday, Dec. 11, 1880, and for the following weeks in that month.—H. B. B., Sec. S. B. of H.]

I have not been able to satisfy myself that all or most of the cases here were due to that cause. Their distribution, in the male department at least, is not what would be expected, on that supposition, while the relatively small number of cases among those most thoroughly exposed, and the considerable number in which no exposure could be traced, alike point to some other mode of propagation. If, on the other hand, it is to be considered due to imperfect sewerage or defective ventilation, it is evident that the defect must have extended, at the same time, to all parts of both buildings. The recent researches of Drs. Wood and Formad would seem to point to the possibility that the specific cause of diphtheria may be a modification of some of the ordinary bacteria of putrefaction, in which case they might be supposed capable of propagating themselves in the sewer-pipes, and thus invading all parts of the institution. It would probably, however, as yet be rather premature to accept these conclusions as established. In the meantime, carefully observed facts must be the test of every theory.

W. L. WORCESTER.

[In a subsequent letter Dr. Worcester wrote, in response to questions, the following]:

There were 62 cases in which diphtheritic membrane was discovered. Five persons, three males and two females, died from the immediate effects of the disease, and two females from more remote effects.

There were in the asylum three male and two female patients under 15 years of age, only one of whom (case 10 at male department) was attacked; he recovered. There was also an infant at the male department, born January 3, 1881; not attacked. No other children at the asylum proper. I have already mentioned the cases at the engineer's house; all the younger children of the family had the disease. The herdman, living just across the road east of the female department, had three young children, none of whom were attacked.

A discussion of the pathology of diphtheria would exceed the limits of a letter. I have already expressed my belief in its contagiousness, but I am equally confident that it may and does occur sporadically, and am by no means satisfied that when it is epidemic its spread is always due to contagion. My impression is that it may develop out of an ordinary angina, as erysipelas, which is also pretty certainly contagious, does out of an ordinary inflammation. While it is doubtless true that a study of the spread of diphtheria which leaves out of account the possibility of contagion from imperfectly developed cases is defective, I incline also to think that to assume the contagiousness of every case of sore throat occurring at such times would equally introduce sources of fallacy. I confess my inability to determine what cases should be considered diphtheritic in the absence of membrane.*

* [While it thus appears that from the standpoint of the physician there is yet doubt as to the possibility of stating in every case whether diphtheria is present or not, from the standpoint of the health officer no such hesitation is permissible. The Michigan State Board of Health has adopted preambles and resolutions substantially as follows:—That it is often difficult to recognize mild cases of diphtheria, or distinguish them from simple pharyngitis, or laryngitis, and as such mild cases of diphtheria often communicate a fatal form of diphtheria, that in each such case it is the duty of physicians, householders, and local boards of health to give to the public safety the benefit of the doubt; that suspected cases of dangerous diseases should always be reported and precautionary measures should be taken. These resolutions may be found in full in the abstract of the proceedings of this Board at its meeting Jan. 10, 1882, printed in the first part of this volume, and paged in Roman numerals.—H. B. B., Sec. S. B. of H.]

SANITARY WORK IN MICHIGAN—ANNUAL ADDRESS.

BY HON. LE ROY PARKER, OF FLINT, PRESIDENT OF THE MICHIGAN STATE BOARD OF HEALTH.

In accordance with the rules of this Board, and in pursuance of a custom of my predecessors in office, I herewith present my first annual address to the State Board of Health. In my desire to profit by the example which has been so worthily set by the men who have filled the office of President during the existence of this Board, I have carefully reviewed the addresses which have been delivered by them, and which have been published in our Annual Reports. While I have derived much pleasure and profit from the perusal, I am not a little dismayed at the thought of attempting to follow in the footsteps of such eminent sanitary authorities as Drs. Hitchcock and Kedzie. I feel that I can add little to the list which contains such able and instructive papers as the introductory remarks of Dr. Hitchcock, his addresses on "The Entailments of Alcohol," "Local Boards of Health," "Achievements of Hygienic Science and Art," and "Heredity in its relation to Public Health," or the later addresses of my immediate predecessor, Dr. Kedzie, on "The Work of the State Board of Health," and "A Historical Review of Legislation relating to the Inspection of Illuminating Oils in Michigan," papers which are characterized by deep research and profound learning; which discuss subjects of vast importance to the public in its relation to healthful living, and which are full of wise suggestions and recommendations for the guidance of the Board in its work.

In the address by Dr. Kedzie on "The Work of the State Board of Health," he reviewed the work accomplished by this Board during the first five years of its existence, in its effort to promote the public health, and to perform the duties imposed upon it by the law which created it. He then enumerated some of the subjects which in the immediate future demanded the consideration of this Board. Let us look for a moment at the subjects recommended by him for our consideration, and see how much of that work has been carried on during the intervening four years, and how much of it yet remains to be taken up.

He first recommends that the section of the organic law of the Board which directs that they shall from time to time recommend standard works on the subject of hygiene for the use of the schools of the State, be referred to a com-

mittee to report to this Board at an early date either by recommending standard works on hygiene, or by pointing out the inability of the Board to comply with the law. Thus far the Board has not recommended any work on hygiene for use in the public schools. A committee was appointed to carry out this suggestion, and the report made was in effect that no work of a scope and character sufficiently practical was known to the committee, which they could recommend for adoption in the public schools. The great necessity for such a work must be apparent to every one. In no other way can information of so useful a nature be so well conveyed to the minds of those who are to be the builders and occupants of the homes of the future, as by placing in the hands of the school-children of to-day, at a suitable age, some plain, simple, and correct principles of healthy living, making it a part of their daily study, until they shall know as well what things and what manner of living are unhealthy as they now know that fire will burn and water drown. It is the primary object of this Board to disseminate information as to the best conditions of healthful living as widely as possible. What more fertile field can be found for the planting of the seed of sanitary knowledge, than the minds of our young people. If early and properly taught the plain and practical principles which govern good health, they will be far more likely to observe and carry out those principles than if such instruction is deferred till a maturer age, when lack of time, indifference, and possibly prejudice, would, in all probability, render it of much less benefit. I would, therefore, renew the recommendation made by Dr. Kedzie, and suggest that a committee of the Board be instructed either to select some work on hygiene which comes nearest to being perfect, or take such measures as will insure the preparation of such a work as this Board can recommend for use in our public schools. It would seem that from the great number of books on hygiene that have been published, some one could be found that might be used with benefit; or from the number of intelligent sanitarians in this country some one might be led to undertake the preparation of such a work.

In regard to utilizing the material which has been accumulated through the reports of our meteorological observers and special correspondents, much has been done. Weekly bulletins concerning the prevalence of diseases throughout the State are now prepared in the office of the Board, and are widely published in the public press. The reports of meteorological observers are now compiled and published in the Annual Reports of the Secretary. They have been carefully digested and prepared, and are available for use in connection with the facts respecting sickness in Michigan, which are supplied by the weekly reports of diseases. These facts are tabulated and published in the Annual Report.

In accordance with the recommendation of Dr. Kedzie, the committee on legislation in the interests of public health, and the Secretary of the Board, were appointed a committee to prepare a bill, embracing some much-needed changes and additions in the law providing for the collection of vital statistics. Such a bill was prepared and its passage was urged upon the Legislature of 1879, but for some reason it was not acted upon. I would recommend that the bill be again presented to the next Legislature, and the attention of the members be called to its merits, and to the need that exists for the adoption of this, or some other bill containing the desired amendments.

A general circular on disinfection, giving full directions and precise instructions in regard to the methods of disinfection to be employed in every self-propagating disease, is now in process of preparation.

In regard to a sanitary survey of the State, Dr. Kedzie said that he called the attention of the Board to the "necessity of a sanitary survey of the State at an early date, with some hesitation, because it is too great a work for the Board to undertake unassisted, and especially without an appropriation of money by the Legislature to defray the necessary expense of such a survey." It is with much hesitation that I refer to the subject. I have been one of the committee appointed to consider and report upon a plan for conducting a sanitary survey, and if any one is responsible for any lack of action in this matter, my share of the burden is as great as that of any other member. The great work, although much thought of and discussed by the Board, remains as yet untouched. The committee appointed have not been able to formulate any scheme which, in their opinion, would be at all practicable, or would be at all likely to meet with the approval of the Legislature, to whom we must look for authority and the necessary means to carry on such a work. Such a survey, in order to be of value, must be thoroughly and understandingly done. There must be a complete and uniform plan adopted before any work is performed, in order that those employed in prosecuting the work may make every needed investigation at the smallest expenditure of time and money. Everything that is desirable to be known of any locality, either in the air, earth, or water, which may determine the sanitary or unsanitary conditions of the place, or which may be of use in guarding against unsanitary influences should be studied into, as far as practicable, by the same observer at the same time, in order to avoid duplicating the labor of traversing and examining each locality.

Much work has already been performed in former geological and topographical surveys of the State, which may perhaps be adapted to and utilized for the purposes of a sanitary survey. The material knowledge already acquired by these surveys may, perhaps, give sufficient data to determine the relative proportions of land and water, of marshy, low and high lands, as well as their location; and possibly they may give, with sufficient particularity, the conformation of the surface of the ground, so that the natural drainage of the soil may be ascertained without the necessity of a second survey being made to determine these points. It will be proper for whatever board or commission may be entrusted with the work of carrying on a sanitary survey, to ascertain fully what material of this kind has already been collected which may be used in perfecting their work.

I need not enlarge upon the advantages which would accrue to the State if a proper sanitary survey could be made. That the health interests of the people would gain much, cannot be seriously questioned.

The subject of sanitary conventions, which Dr. Kedzie formally presented to the Board four years ago "with a good deal of doubt and hesitation," I am now happy to refer to as one of the great successes attained by this Board. Beginning with the convention held in the city of Detroit in 1880, they have been attended with a great degree of interest, and each convention has seemed to be an improvement on the preceding ones in respect to the public attention excited, and the character and practical usefulness of the subjects presented and discussed.

These conventions appear to meet a long-felt public want—that of affording an opportunity for the presentation to the people of the various localities, and indeed to a much wider audience through the generous offices of the newspaper press, of topics relating to public health, which are listened to and discussed

with great interest. The fact that the public take part in the conventions is of itself a reason why there is more interest in the subjects presented than if the same matters were treated in the pages of our Annual Reports alone. I think the experience thus far gained from the conventions already held, warrants me in saying that they are one of the most powerful and efficient means of disseminating useful sanitary knowledge among the people, which we have employed. Their good effects are apparent in the after results in the towns where such conventions are held. In most instances the citizens are aroused to the necessity of establishing and maintaining an efficient board of health. More efficient measures are taken for the suppression of outbreaks of contagious diseases. A better understanding of the necessity for cleanliness, good sewerage, and good ventilation prevails. The relations between the people and the health authorities are usually more cordial, and a stronger support is given to the health officer in his effort to administer the public health laws.

The efforts of this Board to secure the coöperation of the National Board of Health in establishing a system of inspection of immigrants at the ports of entry in this State, in order to guard against the introduction of small-pox and other dangerous diseases, have met with success. Inspectors have been appointed at Port Huron and Detroit, and a beginning has been made in a work, the great advantage of which to this State and to the States lying west and northwest of us, cannot be too highly estimated. It is to be hoped that no attempt will be made to limit the usefulness of this important auxiliary to the public health service.

This Board has already accomplished much in the nine years of its existence, but like other work done for the public good, that which has been performed seems only a preparation for much more that is to follow.

The field of public health work is continually widening out. New subjects for study are presented from time to time, arising from changes in modes of living, from the shifting of population, from the steady increase of immigration, from the production of new articles for consumption, and from various sources furnished by our marvellous growth as a people.

To meet the demands made upon health boards to secure for the public as absolute immunity from disease as possible, more work will be required from these servants of the people. In return for this, and in order to secure the best work, the people should be willing to make some compensation. The members of this Board have always performed the duties of their office without compensation. They have freely given their time, not only to attending the regular and special meetings of the Board, but to those studies and investigations, and to the preparation of the results of their researches, which have proved of great value to the State, and which have given our State Board of Health no inconsiderable reputation among sanitarians both at home and abroad. The Legislature has been liberal in appropriations for the actual expenses necessary to enable the Board to carry on its work. It might with great propriety go a step further and grant moderate salaries to those who now expend their time and labor in carrying out the sanitary work of the State. I can the more freely urge the payment of salaries to the members of this Board by the State, as my term of office expires with the coming January, and I can, without suspicion of a selfish motive, ask for those who continue to labor in the field of public health, some compensation for their services.

The health officers of the municipalities in particular, should receive more pay than they now have. It is their care to watch for the first intimation of

danger from disease in their locality; to take prompt and efficient steps for its suppression, and in the hour of peril they must give up all their personal interests for the public good. In the majority of cases health officers, who are usually physicians in good practice, have little or no pay for the valuable services which they render, and for the valuable time which they are obliged to give for the good of the public.

The public health laws of the State, by which most of the local boards of health are governed, are not fully adapted to meet all the requirements of the best public health service. I regard it as important that an effort should be made to secure certain amendments to the existing laws, and also some additional legislation, which shall define more particularly the duties of health officers and boards of health, and which shall provide for the payment of such expenses attending the administration of the health laws as our present statutes do not fully make provision for.

The investigations which have been made into the relations of preventable disease to taxation, should be continued. From the data already acquired we are enabled to judge somewhat of the enormous sum which we as a people are required to pay each year to maintain those who become a public charge by reason of preventable diseases, and to make good the waste of human life from the same cause.

It is a serious problem, not only for sanitarians to consider, but for political economists, how to save to the State the loss which is thus annually entailed. Although the duty of the Board as defined by the law creating it, is that of "the general supervision of the interests of health and life of the citizens of this State," without reference to the economic features of that work, yet if by our efforts and those of our co-laborers in the local boards of health, the State is saved even the half of the annual expense caused by preventable sickness, a most valuable service will be rendered, and the Board will in this way perform its duty in the broadest sense of the term.

The field of investigation into the causes, extent, and results of alcoholism, is a broad one, and in the first annual address of Dr. Hitchcock, our first President, he pointed out the duty of this Board to make such investigation. If we do not agree that alcoholism is a disease in itself, as is claimed by many able thinkers, we can at least be assured that it begets disease and death. It is therefore a legitimate subject for our study in all its relations. It has an aspect aside from the moral question involved, which it behooves those who are interested in the highest welfare of the State to study into. That aspect which affects the health and life of our citizens, we should study.

A paper was read before the health department of the American Social Science Association, at its recent meeting at Saratoga, by Miss Clara Barton, on "International Relief in War." It outlined the work and aims of the Society of the Red Cross towards mitigating the horrors of war, by an international agreement to adopt certain measures for the relief of the wounded in battle. It seemed to me, as I listened to it, that if the relief of the wounded in battle by an international agreement, was a proper subject for discussion by a public health body—and I did not question its propriety—still more proper would be a discussion of measures to prevent such wounding and killing of men by an agreement entered into by all nations to do away with battles entirely. Possibly in the not far distant future, state and national boards of health may find it to be within the province of their duties to exert an influence, in the interests of the health and life of the citizens, to induce the

nations of the earth to submit their differences to courts of arbitration, and to substitute the peaceful methods of legal procedure for the dreadful arbitrament of the sword. So that day,

> "When the war drums beat no longer,
> And the battle flags are furled,
> In the parliament of man
> The federation of the world,"

Some portion of the glory of having brought about that era of freedom from the slaughter of man by his brother man, should belong to those who labor in the interests of public health and for the life of the citizen.

COMMUNICABLE DISEASES IN MICHIGAN, DURING THE FISCAL YEAR ENDING SEPTEMBER 30, 1882.

A HISTORY OF SOME OF THE WORK BY THE STATE AND LOCAL BOARDS OF HEALTH. PREPARED IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

In October, 1881, a letter was devised which was sent, from time to time, by the Secretary of the State Board of Health, to the health authorities of each locality where either diphtheria, scarlet fever, or small-pox was reported to be present. As soon as information was received of the outbreak of either of these diseases, the letter was sent. This letter transmitted copies of the document prepared and issued by the State Board, treating of the restriction and prevention of the disease to which the letter referred, also copies of the circulars issued by the State Board, one relative to the work of health officers, stating their duties, and one relating to notices of diseases dangerous to the public health. The letter called attention of health officers to their duties in restricting the disease, and asked for replies to the following questions:—

1. Please state the disease about which you are writing?
2. What was the source of contagium?
3. How many cases of this disease have you had in this outbreak?
4. How many deaths have you had from this disease?
5. What measures have you taken to restrict the disease?
6. What success have you had in restricting its spread?
7. How many cases have you at the present time?

As this letter was sent to a great many localities, a great many replies were received relative to the three diseases. Not all the replies answered the questions completely, but it is known that many local boards were thus spurred into action which otherwise might have allowed the disease to increase without so timely effort at restriction. It is not supposed that this letter was sent to every locality where these diseases were present, for probably the knowledge did not in every case come as it should to this office. The replies show a commendable degree of activity on the part of many local boards of health, and an encouraging outlook for the future. The letters have been somewhat compiled, those relating to each disease separately, and the results follow.

DIPHTHERIA IN MICHIGAN—YEAR ENDING SEPTEMBER 30, 1882.

Letters were sent to about 290, and replies received from 162 localities. From some of them accounts were received of a second outbreak, in some instances entirely distinct from the first. The total number of cases cannot be given with any degree of certainty because many of the letters were written during the prevalence of an outbreak, before the whole number of cases which would occur was known; many of the letters gave accounts of the outbreak, but did not state the number of cases. From those localities from which statements of the number of cases were received, a total of 1,206 cases were reported, and 296 deaths. It would not, however, be very profitable to calculate the death-rate of diphtheria when the two factors are, for that purpose, so manifestly incomplete, and especially as diphtheria is a disease which varies in its death-rate very greatly with the age of the persons sick, being especially fatal to children aged about four or five years.

SOURCE OF CONTAGION OF DIPHTHERIA.

A large number of persons neglected to state the source of contagion. probably because of the fact that the methods of its communication are so varied as to be bewildering to an unprofessional mind, and many of the health officers of townships are not physicians. To these persons, as well as to some physicians, the source of contagion seems to have been at once attributed to the insanitary surroundings of the sick persons, and this may account for such replies as "malarial," "millpond," "very filthy," "impure water," and "colds." It is noticeable, in at least one instance, that where the emanations from a mill-pond were reported as the cause of diphtheria, the measures taken to prevent the spread of the disease were isolation, disinfection, and the sending home of scholars found sick in school. One would hardly suppose that to be the best way to prevent its spread, *if* it was really caused by the mill-pond; but the view evidently was, that though a contagious disease, diphtheria may be originated without aid from a previous case, a view perhaps somewhat akin to that of the spontaneous generation of organisms. Other sources of contagion were given as follows: Imported from Wisconsin; brought in clothing; thirteen reported the disease imported in different ways. Several reported cases occurring in houses where the disease had existed previously. One of the most instructive accounts of the modes of spreading diphtheria which has ever been published, is the brief history of the outbreak in Bushnell, Montcalm county, contributed to this article by Dr. George Pray, of Wood's Corners, Ionia county, and which is printed on page 366. Dr. Ryno, of Wayland, Allegan county, also contributes interesting data on this subject.

PERIOD OF INCUBATION OF DIPHTHERIA.

Dr. George Pray reported a case where from the first exposure to diphtheria to the date of sickness could have been 9 days, but may not have been more than 4 days. In the same house a servant-girl was an inmate of the house 9 days before she was attacked. Dr. Pray also gives other cases where 5 children were taken ill "about a week" after a first chance for exposure. Dr. O. C. MacDannell reports two cases, the period of incubation in one being 2 days, and in the other 3 days. Dr. Caulkins reports a case where the incubatory period was not over 4 days, and possibly (though not probably) less. He also reports a case where the period of incubation was two weeks.

Dr. A. G. Bruce reported a case, where a young man had sore throat but no conclusive evidence of diphtheria, and one day after coming in contact with diphtheritic cases, had malignant diphtheria. He also reports a case where the period of incubation was not to exceed 9 days, one where it was 10 days, one not to exceed five days, one where it did not exceed 7 days, one not to exceed 6 days, one where it might have been 8 days, one where it was 11 days, one where it was two days or one week, and it is not apparent which. Dr. J. H. Guthrie reported ten cases where the period of incubation is not definitely stated, is given as "a short time," but the period of incubation in all ten cases did not vary more than three days. Dr. E. H. Ryno reported concerning four children exposed by a child who had had diphtheria weeks before, and who still had a discharge from the nose, and that the period of incubation was nearly the same in all the four children exposed.

Dr. J. E. Gruber reported two cases of diphtheria which developed 9 days after opening a trunk which contained an infected doll. Dr. H. H. Chase reported the incubation period in 25 cases as follows: 3 days, 1 case; 4 days, 1; 5 days, 5; 5 to 10 days, 1; 6 days, 1; 7 days, 3; 9 days, 2; 10 days, 2; 11 days, 3; 14 days, 5; 30 days, 1. Dr. J. W. Hauxhurst reports a case where the incubation period was one week. Dr. J. J. Robbins reports a case where the possible period of incubation might have been two weeks. Dr. Hugh McColl reported a case where the period of incubation was from Friday to Sunday, two days, and one where it was three or four days. Dr. Worcester, in an article on pages 344–355, of this Report, gives a case where, if the disease was contracted in a jail where there had been cases of sore throat, the period of incubation was 4 days; in one case the period would seem to be six days (case 5 on page 348); one case (1 on page 353), where it would seem to be four days.

REPORTS OF OUTBREAKS OF DIPHTHERIA, AND ACTION OF LOCAL HEALTH AUTHORITIES TO RESTRICT THE DISEASE.

Dr. Wm. M. Preston, health officer of Charlevoix township, Charlevoix county, reported on Aug. 15, 1881, a case of diphtheria which occurred in a patient just arrived from Wisconsin in a schooner, who probably contracted the disease on board ship. Dr. Preston writes that he disinfected thoroughly with burning sulphur, chlorine, carbolic acid, and copperas water, and has never had a second case in the same house. In the same letter he reported diphtheria occurring in persons (one died) who visited the township of Marion where there were cases.

Dr. I. N. Smith, health officer of Saginaw, in reply to a letter from this office, wrote on Oct. 10, 1881, regarding the mode of work by the health authorities of that city, as follows:—

The health officer of Saginaw City, under the instructions of the board of health of said city, has attended to all the precautions that the board thought necessary to prevent the spread of contagious diseases. They have furnished blanks for weekly reports to all physicians having patients in this city, a copy of which I herewith enclose; also a card calling for all cases coming under the care of any physician in this city. These cards are sent to each physician every three or four weeks, and especially if a case of contagious disease is not reported immediately. When any such case is reported, the health officer repairs to the house where such case is confined, and posts a conspicuous card with large letters so it can be read from the streets, stating the name of such disease on the card; and besides, he enters the house and warns the inmates against allowing any communication with the sick person, except such as is positively necessary, as a nurse and the attending physician; and those on attendance are forbidden to attend public meetings or visit friends while they are thus attending the sick, and afterwards not till they have carefully washed themselves and disinfected their clothes. The board have forbidden all children from attending church or our public schools from houses where any one is sick with any contagious disease danerous to public health. The board have ordered a thorough disinfecting of sick-rooms after the

patient is removed therefrom. They have positively forbidden public funerals of all cases having died of contagious diseases, and have actually interfered with such as have not regarded the order, by a warrant placed in the hands of the city marshal.

The board has ordered the health officer to see that cases that have died of diphtheria be placed in a coffin as soon as may be after death, and securely closed and not again opened, and to prevent a public gathering at such cases. The health officer has attended to the order of the board in this matter, and actually sent home all children and prevented all grown persons except relatives and those necessary to bury the dead, from coming into the house, and has twice closed the church to funerals of diphtheria. The health officer has given notice to the prosecuting attorney in two cases where physicians failed to make their reports until after they had received a letter from the attorney.

The board has recommended that the city be thoroughly drained by large and extensive sewers, and five have been built the present summer, running from the back part of the city to the river, at a cost of about $15,000; also one and one-half miles of paving and graveling has been done, making a true grade so as to carry off the surface water to the sewers, besides opening and grading the bottom of ditches in all parts of the city so as to carry off surface water in the spring, as recommended by the board of health.

The overseer of the poor has, by direction of the board when found necessary, distributed provisions to those sick with a contagious disease, so as to prevent their spreading the disease, especially when they were dependent upon their daily labor for the support of themselves and family, and forbidden to go abroad by the health officer on account of such disease being in their family. In many cases the family are very poor, and from six to ten persons live in one or two common-sized rooms; cook, eat, drink, and sleep, all in the same room. When one of the family takes a contagious disease, especially diphtheria, all the other children in such families are almost sure to contract the disease, as it is almost impossible to keep them separate and carry out the orders of the board when there are only one or two rooms and a whole housefull of children. Many of the people are very ignorant, and do not understand the importance of carrying out the instructions of the board. They think it a disgrace to have a large "*red card*" put up on their houses, and sometimes they tear it down, though told by the health officer that they would be liable to prosecution if they did so. The disease this summer, since June 4 to October 1, has been mostly confined to poor people. Since June 4 there has been, according to my record, 34 cases of diphtheria, or an average of two a week. They have been light cases, most of them. Our physicians are better acquainted with the disease now than formerly, and are more successful in their practice. Formerly many cases reported as "*sore throat,*" I found on examination to be genuine cases of diphtheria. Physicians have been a little slow to acknowledge that they had cases of diphtheria, for fear that it might injure their practice, especially in families where there are children.

This summer has been very dry in this city and the wells have been very low, and half or two-thirds of them actually went dry. When the wells are very low the water is poor, and many of the poor people have resorted to the river-water for domestic use; and the board find it almost impossible to prevent the use of it. The pipe of the water-works has been extended up the river and onto the other side to get rid of sewage, and there is much improvement in the water. Still, we do not consider it fit for domestic use. We have ten or fifteen artesian wells and most of them are very satisfactory, and the water good and softer than river-water. Dry weather does not affect them.

We have had a number of cases of typhoid fever this fall, and some deaths.

There has been a decided improvement in the health of the city since the rain.

The request sent by Dr. Smith to physicians in his city, to report cases of disease in their charge, is as follows:—

SAGINAW CITY, ..., 188-.

Will you please make a weekly report on Saturdays of all cases of disease coming under your care during that week. All cases of a malignant or contagious character should be reported immediately to the health officer of this city. Blanks will be furnished for you to fill out. The blank will sufficiently explain the manner of making the reports, and also cites you to the law under which they are demanded.

I. N. SMITH,
Health Officer of Saginaw City.

Dr. Geo. Pray, of Wood's Corners, Ionia county, supplied the following account of an outbreak of diphtheria in Bushnell township, Montcalm Co. His report is dated Oct. 12, 1881:—

My field of labor, although my residence is in the township of Ronald, extends over portions of several neighboring townships in Ionia and Montcalm counties, and I report all cases which come under my notice in all those townships. The township in which the cases of diphtheria occurred is Bushnell, Montcalm county. Diphtheria has been prevailing to some extent in a neighborhood in that township for the last six months. Several deaths have occurred, and much sickness and

suffering, which I have no doubt could have been avoided had the requirements of our laws, as directed by the State Board of Health, been strictly observed. A short history of this outbreak, as illustrating the spread of this disease by contagion, might be interesting, and will be furnished if desired. An outbreak of the disease occurred also in the neighboring township of Orleans, only one case of which came under my personal observation. There were a number of deaths, and from the history of this outbreak, as I heard it, *I believe the whole of it after the first case could have been avoided.*

I think, from my own observation, that in the country especially, the laws in regard to contagious and dangerous diseases are but little respected by either physicians or the people. I know of no way to remedy this difficulty but to enforce the penalties of the law in a few cases.

The health officer of the township of Ronald is C. C. Eply, M. D., Palo, and, by the way, a competent and thorough officer, could he have the assistance and co-operation of the people. But one case of diphtheria has occurred in our township, and that was an off-shoot of the Bushnell outbreak. Thorough and efficient means were used by the health officer to prevent its spread.

Dr. Pray was requested to furnish a more detailed account of the outbreak of the disease in Bushnell, and his report in compliance with that request is as follows:

I cheerfully comply with your request to furnish a brief history of the recent outbreak of diphtheria in the township of Bushnell, Montcalm county.

In the last days of March last, James Hall and his son-in law, George Staines, went to Ionia accompanied each by his son, boys of 12 and 5 years of age. Soon after, both of these boys were taken with diphtheria about the same time, and on the 2d day of April the Hall boy died; the other recovered. It was believed by the parents of these children that they got the disease by playing with an infected mouth organ while in Ionia, but this was mere conjecture. The parents of both were affected by the diseases, the Halls quite severely. During the sickness of the Halls, they were waited upon by George Stoddard, a neighbor, who also after their recovery assisted them in washing and cleansing their house. When he went home to his family he was careful to wash himself thoroughly and to change his clothes throughout, putting on a suit which he kept in the barn, but doing up in a bundle his infected clothes and taking them home with him unwashed. These he did not take into his house, but had them thoroughly washed first. This was the last heard of diphtheria in that township until in the middle of July, three months after, when a son of this George Stoddard was seized with sore throat which proved to be diphtheria of a mild form. His other children, three in number, were in turn affected by the disease, as was also a daughter of his brother, R. Stoddard, who lived in the same house. All of these recovered. George Thomas lives on the opposite side of the road, a few rods from Stoddard's. His children had mingled intimately with the Stoddard children before it was known that they had diphtheria. His eldest son was seized July 23, and in turn the whole of his family, seven in number, were affected by the disease. Two of them, boys of three and twelve years of age, died. Richard Stoddard moved to the village of Palo, where another daughter was affected, but prompt and efficient measures were taken to prevent its spread, and no other cases occurred in that place. During the sickness in George Thomas' family, a nephew of his, a son of Widow Thomas who lives three-fourths of a mile away, was at but not in his house. Soon after on July 31, this boy was taken with the disease, and in turn all the members of his mother's family, except one boy, seven in number, were affected by the disease, some of them very severely. All have recovered except one, who is slowly recovering from paralysis, a sequel of the disease. John Staines, a brother-in-law of George Thomas and a brother of Widow Thomas, lives at a point half way between He was very careful to keep his children away from those infected, and although he freely assisted his relatives in their affliction, he kept himself aloof from his family until he thought all danger was passed. His son, a boy 16 years of age, afterward helped his uncle, George Thomas, in threshing, and there came in contact with those who had some time before had the disease, and soon after, on the 18th of September, was seized with it, and died on the 23d. His only remaining son, about four years of age, was taken Sept. 27, and died Oct. 1. A daughter 14 years of age has thus far escaped. After the sickness in George Thomas' family, his house was thoroughly cleansed and renovated, being newly white-washed and papered, and was supposed to be disinfected. Notwithstanding all this, more than two months after, on the 21st inst., Lizzie Soulle, a hired girl who had been an inmate of the house nine days, was seized with the disease and is now sick.

It has thus far been confined to this circumscribed territory, no other cases having occurred at any other point very near.

Dr. C. C. Eply, health officer of Palo, mentioned in Dr. Pray's report, reported the following outbreak of diphtheria, Feb. 27, 1882, in the township of Ronald, which adjoins Bushnell township on the south:—

There is a very severe outbreak of diphtheria just now in the west part of our town. Five children in one family have been attacked within the last two weeks, and three of the five are *now*

dead! Dr. Geo. Pray, the attending physician, thinks the source of the contagion is a young man who came there after having nursed a family sick with diphtheria, near Big Rapids. This young man claims to have bought a new suit of clothes and put on since leaving the family that had diphtheria, near Big Rapids, and that he brought none of the clothes worn while nursing said cases to the house where he is now staying, and in which this severe outbreak of diphtheria has occurred.

A portion of three other families were exposed to the contagion before its nature was known, but there have been no cases in these families yet. We have closed the school, and taken such steps as seem necessary to prevent the spreading of the disease.

The *house* in which this outbreak occurred is a small, cheap, board structure, and the board of health seem to think that the *cheapest* and *surest* way of disinfecting the premises will be to *burn* the old shanty after putting up a new one.

In relation to this case Dr. Pray wrote Feb. 27:—

A young man from an infected house in Paris, Mecosta county, came into the family of Alfred Wilson, of *Ronald, Ionia county*, bringing with him the contagium of diphtheria. In about a week Wilson's children, five in number, began to come down with the disease in a virulent form, and three of them have died. The disease is as yet restricted to Wilson's family.

Dr. G. W. Topping, of De Witt, Mich., writes Nov. 6, 1881: "I can see that more care is taken to prevent the spreading of diphtheria where the document [relating to its restriction and prevention] has been sent. I think they will do much good."

Dr. O. C. McDannell, of Lowell, reports an outbreak of diphtheria contracted in a house supposed to have been thoroughly disinfected after cases of diphtheria, and one supposed to have been communicated by a physician. His letter, dated Nov. 23, 1881, is as follows:—

The four cases of diphtheria reported last week, and two that should have been reported the week before, making six cases—five in one family and one in another, with three deaths—comprises all the diphtheria we have had in this township since last July, when we had eight cases in one family and one death. The history of this family is: Germans, living three miles from the village, and a family that live entirely within themselves in as healthful a location as there is in the township. On July 2, two oldest boys visited friends in Grand Rapids, a family that had been suffering with diphtheria, but two weeks had elapsed since the premises had been (as they claim), thoroughly disinfected. On the morning of July 4 one of the boys was taken sick. On the morning of July 5 the other boy was taken sick. They returned home and the whole family, eight in all, suffered with it and one died. In regard to the last six cases, they too were in the country, six miles from the village. It is charged that they received the contagion from a physician (called to wait upon a lady in confinement), who had been visiting cases of diphtheria near Hastings.

Dr. G. W. Stone, health officer of Metamora, Lapeer county, reports under date of November 25, 1881, as follows:—

I received the circular and letter, and was very glad to get them. We have (of late) had three cases of diphtheria. No. 1 died, contracted it at Bay City. No. 2 my brother treated, and is getting better; contracted it from clothing that had been in a house where two patients died, in the township of Dryden. No. 3 is better this A. M., but not out of danger; contracted it at case No. 1. The town board of health leave all the work with me, and I have been very thorough in carrying out all the requirements of the law. I think we have it under control.

Dr. John S. Caulkins, health officer of Dryden, Lapeer county, reported on Nov. 13, 1881, cases of diphtheria which have more or less connection with those reported by Dr. Stone in Metamora. Dr. Caulkins' report is as follows:—

The package of pamphlets was received, and yours of the 9th relative to them and the diphtheria reported by me last week.

The disease is in the family of Charles Watson, of my own township of Dryden, of which I am the health officer. There have been three cases, two of them fatal, the last one having died this morning. The cases have not been in my care (presumably for the reason that it is nearer to Dryden village), although I have generally been their medical attendant.

There was no funeral in the first case, nor will there be in this. The neighborhood is well up in the knowledge of necessary precautions, and so thoroughly alarmed that nothing will be omitted that can be done to restrict the disease to Watson's family. There are no more children to have it, and if the parents escape the disease I shall see to the thorough disinfection of the house without delay.

On Nov. 29, Dr. Caulkins reported additional facts as follows:—

The cases of diphtheria about which I wrote are recovering, and so is a subsequent one in Metamora, which probably had a common origin with mine; the first case there had not, the family having just returned from Bay City.

Enquiry since I wrote you has elicited the following additional facts in regard to the cases:—

Not only did Mrs. Havens, the mother of the sick children, go to Watson's, but so did Belle, an older sister. Belle was working for Philo Isham, at whose house the subsequent case in Metamora is (referred to above) at the time the Watson children were sick; left there, went to Watson's and made quite a prolonged stay, coming away before the first child died; came home and stayed all night at her father's and then went back to her work at Isham's, having quite a sore throat at the time. It was highly probable that she, instead of her mother, was the carrier of the seeds of the disease, perhaps communicating it directly to all three cases. Concerning this probability, see your document, page 7, clause 16.

I am greatly in hopes that the disease will spread no further. Anything but diphtheria.

On Dec. 20, 1881, Dr. Caulkins reported additional cases as follows:

With regard to Dryden, enquiry shows that one family, two miles east of the village, have the disease, one case having already proved fatal, with other members of the family sick. The other cases of sore throat in the vicinity seemed to have been simple, non-specific tonsillitis, which is just now very prevalent about here and often really severe. If you have a map of Lapeer county you will see that the locality of the cases of diphtheria is a mile out of our township into *Almont*.

I was informed yesterday that there were two children dead of diphtheria at *Attica*, which is nine miles from here. Dr. Blake attends to the cases by order of the Township Board of Health, the family being very poor Irish folks.

Dr. Caulkins reported another outbreak on May 15, 1882, which is interesting because of the evidence as to the period of incubation. His letter follows:

You will observe by my health report card this morning that diphtheria is on it again. There have been but two cases, and both are recovering under my own charge. There is only a small child in the family besides the man and his wife, and in case that shows no signs of the disease by Wednesday, I shall have the house cleaned up then.

As facts are always welcome to you, I will tell you what I have observed with regard *to the period of incubation in these cases.* Willie Moon, whose home is Attica, was at work as shingle packer in Stephen Smith's mill in Deerfield, when diphtheria was prevalent. There were five deaths within half a mile of the mill, which has a wretchedly bad location on the edge of a very shallow lake. There were several cases in the boarding-house. The jointer, a boy by the name of Ivey, died within 24 hours after he felt the first attack, and the hired girl barely lived through it. Young Moon no doubt caught the disease of the girl, coming down in a few days after the girl left the mill for her own home, and where he went once to see her after she was moved. As soon as Moon found that he had got it, he left for home, where he arrived on May 1. On Saturday the 6th, Lewis Moon (my patient) heard that his brother was sick, went to see him and stayed all night, sleeping in the same bed with him. On Wednesday the 10th, Lewis was taken with a severe chill (about 9 A. M.) and the disease developed itself with the most alarming rapidity. In his case the incubatory stage is not more than four days and a few hours over certainly; how much less we do not know, for whether he took the virus in the house with his brother, or brought it away with him and took it subsequently, it is impossible to tell. The woman, his wife, sickened on the 12th, but her case proves nothing on this point as she was with Lewis at his brother's.

Dr. Caulkins reported, July 17, 1882, additional cases with more facts relative to the period of incubation, as follows:—

You had better forward to me another lot of the documents on the restriction of diphtheria, as there have been several recent cases in this vicinity, one on July 9th, a girl of 10 years of age, quickly fatal. This was in the township of Metamora, and was under the care of Dr. G. W. Stone, as were all the rest. The disease was limited to the families of two brothers of the name of Burch. It seems that it appeared quite uncertain in its character when it went through the first family, so much so and so light that the doctor hardly recognized it as diphtheria, and nothing was done about isolating or disinfecting. The first cases were in my town, and the doctor told me that he had now concluded that they were genuine diphtheria, and that he would report them to me as such.

I believe that the little girl that died slept a night with one of the other children just as it was recovering. *The incubatory period was two weeks, which was long for diphtheria.*

Dr. Stone's report of these cases is as follows, dated July 20, 1882:—

I received your letter, and in reply would say that I have had four cases of diphtheria—three out of my township and one in my township. The cases out of my township I have reported to the

health officer of that township. The one in my township was taken sick about four days after it was exposed by the family out of township; the exposure was two weeks after they had recovered. I have used all the measures required by law, and there are no cases at present. The last case was about ten days ago.

On December 6, 1881, Dr. Caulkins reported that diphtheria had been present in Oxford, as follows:—

I incidentally learned yesterday that there has been diphtheria in the north part of Oxford, Oakland county, about 5 miles from here, during the latter part of October.

There were five cases, all in one family of very poor people, and strangers, just moved into a poor old log house in which no one had lived for more than a year. One case of the five was fatal. Owing to their extreme indigence they had no medical attendance. My informant said, in reply to my questions, that none of the neighbors had visited the family during their sickness except himself and wife; that no report had been made to the board of health of the cases, and nothing done toward disinfecting the house, which belongs to him (my informant).

I advised him strongly to see to it himself on account of his own little children, as far at least as to burn five pounds of sulphur in the house. He was entirely ignorant that precautions of any kind were necessary in diphtheria, or that there was any danger of the poison's hanging about the old house.

I have a few copies of the document left, which I shall distribute in that neighborhood as soon as possible.

The attention of Dr. W. H. Wilkerson, health officer of Oxford, having been called to the subject of diphtheria in his locality, on December 20, 1881, he reported as follows:—

The board of health of this village and township adopted a resolution, delegating all the power they might have to me as health officer, with orders to act in any case without calling them together. I would like to ask if they have the power to do that?* The five cases of diphtheria in this locality were confined to one house. Two of the five died. I was unable to find out the cause; it certainly was not from contagion. I still continue to keep the family isolated. How long had I better continue? The family have all had it, excepting the father and mother.

Dr. Wilkerson states the cases were not caused by contagion; but if the cases written about by Dr. Caulkins, as having occured the last part of October had no disinfection after them, it is not difficult to suppose that the cases in December could have arisen from them.

Dr. J. W. Mason, of Dundee, wrote the following letter, dated Dec. 17, 1881, which shows intelligent action on the part of health authorities.

Yours of Dec. 14 was duly received and contents noted. In reply, I have the honor to state that we are taking prompt, active, and thorough measures to prevent the further spread of diphtheria, which has just made its appearance in our community. The common council, of which I am a member, are all thoroughly interested in the matter, and afford me all the aid in their power. We are using all the precautionary measures recommended by the State Board of Health, and feel fully confident that we shall stay the further progress of diphtheria. The case reported as having died, in my last report, was taken with diphtheritic croup in the onset; was one year old, lived five days. The one reported this week was three years old, a brother of the former. He had apparently fully recovered from the disease, but through the carelessness of the nurse, while the mother was attending the babe, caught cold and was attacked with diphtheritic croup; lived six days. The other cases reported are out of the corporation, and consequently out of my jurisdiction as health officer. I have attended them, however, and have given all the sanitary instructions necessary to prevent its further spread. I am much obliged for the documents; have distributed them to the best advantage.

Dr. J. A. Lynch, health officer of Manchester, in the following letter describes death from diphtheritic croup, the danger of nursing-babes contracting the disease from the mother, and some of the difficulties met with in attempting to prevent the spread of the disease. His letter is dated Dec. 19, 1881:—

Diphtheria has prevailed in this locality to quite an extent; but most of the cases have been mild, yet having a well defined membranous exudation on one or both tonsils varying in size from

* Probably not *all* the powers of a local board can be delegated to the health officer; but the State Board of Health has recommended that the local board of health beforehand instruct its health officer to begin prompt and vigorous measures for the suppression of a disease dangerous to the public health, immediately on the outbreak of such a disease, and without waiting for a meeting of the board.—H. B. B., Sec. S. B. of H.

one-third inch in diameter to that covering both tonsils and some of the adjacent parts. In most of the cases breath has not been very offensive, yet in a few cases it has been very offensive, and has remained so for several days in spite of the best antiseptics used either internally or as a gargle every hour. There has been one peculiar and very unpleasant feature in several of the cases of diphtheria here for the last few months, that is to assume the uncomplicated form of diphtheria for several days, then to invade the larynx and trachea and prove fatal in spite of all treatment. I have had but three fatal cases from the effects of diphtheria for a good many years, and they all died with this diphtheritic croup. Two of the cases occurred in August and one in October last. I will give you the history of these three cases. Mrs. —— was taken with diphtheria on August 8. They sent for me August 9. The membrane was only on one tonsil and breath not very offensive. But she was nursing her child which was about one year old. I told them to take the child up to the other house and wean it immediately, as her milk would give the child diphtheria if she continued to nurse it. They did as directed for three days, and then, contrary to my orders, they brought the child to its mother who, with more love than discretion, nursed the child, which had been well to all appearances and very good. But on the following day the membrane made its appearance on its tonsils. It did not appear to mind it much for a few days, but then it commenced to have a croupy cough and continued to grow worse until Aug. 22, when it died. The next case was W. H., five years old. He was taken Aug. 14. They did not send for a physician until Aug. 20. When I was called I found considerable false membrane on his tonsils, and that continuous labored breathing, in spite of medicine, which we meet with in cases of membranous croup. He grew worse until Aug. 22, when he died. The other case was D. G., eight years old, living in Manchester He complained of his throat October 17. His parents examined his throat and saw some patches of false membrane, but thought he would get well with domestic remedies; but on October 22 they called me. There was at that time some false membrane on his tonsils, and he was somewhat reduced in strength. He appeared to improve some until October 26, when he commenced to have a croupy cough and more labored breathing. He continued to grow worse, his breathing becoming more and more labored, until he worked himself to death trying to breathe. He died October 28.

In regard to my work in preventing the spread of diphtheria, I would say, I requested the principal of our union school to request the scholars to stay out of school when any member of their family had a sore throat, until they had their throats examined by some physician, so that they should not expose the school to diphtheria. I gave out those few copies that you sent me on diphtheria where I thought they would do the most good. I called the attention of all that I could to the importance of preventing the spread of diphtheria, and gave them such instruction on the subject as I thought they required. There have been some difficulties in this work. Some of the cases of diphtheria have been mild, and there has been considerable sore throat that was not diphtheria, and this has caused considerable disagreement in regard to which cases were and which were not diphtheria. Another difficulty is some get confused on account of there being two health officers, one for the village and another for the township, and they report to the wrong one. It appears to me that it would be much better if only one health officer should be appointed for township and village. It would save each physician the trouble of keeping and making two sets of reports each year. My idea would be to require all reports to be made to the health officer, instead of any member of the board of health. I will see that any documents on diphtheria that you see fit to send shall be judiciously distributed, as we are having some cases yet.

Bell Irwin, clerk of the local board of health of Colfax township, Antrim Co., in the following letter, dated January 23, 1882, describes the outbreak of diphtheria in that township, and their success in restricting its spread by following the rules recommended by the State Board of Health:—

Yours with enclosures received. This being a comparatively new township, disease in consequence has happily not been very rife amongst us. The cases of diphtheria, however, which I have had to report, were of the most malignant type. The swollen nose and the eruptions of blood and matter from the throat, fully attested their extreme virulence. The disease was brought hither by a man from Sanilac county, who had waited upon and assisted in burying a sister about a week previous to its breaking out in the house whereat he was visiting here, namely, his brother's. His limbs from the thighs downwards are covered with chronic running sores, supposed to be of syphilitic origin. This, together with bad water, extreme filthiness, and the fact of *two families* being shut in *one small* room, the doctors say greatly aggravated the disease.

Had it not been for the prompt measures adopted by the township board to prevent its spread, its ravages must have become awful. In this they were greatly aided by adopting the precautions set forth in a valuable pamphlet issued by your Board of Health under the caption of "Restriction and Prevention of Diphtheria." Malignant as the attack was, we were enabled, by following the printed precautions of the State Board of Health, to confine it to the house in which it broke out,

and thus prevent its spread, and the consequent misery and death which follow in its track. There is not now, I am happy to say, a single case of diphtheria in our midst, nor has there been for several weeks.

Dr. W. H. Smith, health officer of St. Clair, on Jan. 13, 1882, wrote concerning the suppresssion of diphtheria, with only four cases, as follows:—

The year just closed in this city has been one of general good health. In the months of September and October four cases of diphtheria were reported. As soon as this disease made its appearance, a rigid quarantine of the affected families was instituted. A copy of the circular issued by the State Board of Health was placed in every diphtheritic household, and also sent to our most prominent citizens. The schools were permitted to continue in session, but all children with sore throats of any kind prohibited from attendance. The result was that the disease was checked, and after the death of those attacked, by the avoidance of public funerals, and thorough disinfection, its germs were apparently destroyed. To all appearances the cessation of the disease was due to the prompt isolation of each case, and other protective measures instituted by the local board of health.

Dr. A. B. Strong, of Reading, on Jan. 27, 1882, reported the death of a lady aged 50 years, from diphtheria, in a letter as follows:—

Yours of January 24, desiring a report of cases of diphtheria, is received. A maiden lady, aged about 50 years; I first saw her Saturday, January 7; found her seriously ill, with well marked symptoms of diphtheria. The exudative inflammation had already extended to larynx and trachea; also decided indications of "blood-poisoning." She died the Sunday night following, probably from asphyxia. Cause not known. No other cases in the vicinity. She was stopping with a family who had four children. I caused her to be isolated as much as possible; room was thoroughly fumigated with sulphurous gas, clothing, bedding, etc., disinfected or destroyed. Children all attacked with the disease. Three very mild cases; one moderately severe, but is now nearly well. Special precautions have been and will be resorted to by way of isolation and disinfectants to prevent exposure. No other cases in the vicinity, and I do not apprehend there will be.

Dr. A. G. Bruce, the health officer of the city of Corunna, sent on Feb. 3, 1882, the following history of an outbreak of diphtheria:—

November 12, 1881, a lady from Bay City came with her three children, who were convalescing from diphtheria, to visit friends by the name of Goward, one and a-half miles south of this place. Frank Goward, aged fifteen, had been complaining a day or two previous to this of sore throat, but as there were no cases of diphtheria in the neighborhood no attention was paid to it.

November 13 I was called to see him, and found a severe case of diphtheria. The same day that these parties from Bay City arrived, Mary Green, aged fifteen, living two miles south of this place, called at Goward's and kissed these children. Nov 21 I was called to see Mary Green and found a malignant case of diphtheria. She died in December. Mrs. Anna Goward was taken Nov. 22. As soon as Mary Green was taken, her two married sisters, Mrs. Ellen Foley and Mrs. Katie Titcomb, who lived in Owosso, five miles distant, were sent for. Ellen was taken sick Nov. 26. Katie did not contract the disease at all.

Wm. Green, aged 18, was at home all the time, and was taken sick Nov. 28. Frank Green, aged 24, was working in a mill five miles east of Green's when Mary was taken sick. He also came home, and he was taken down Nov. 29. Ellen had a little girl, Katie, aged five years, who was left with friends in Corunna.

Before Frank came into the house he left his clothes, which he was accustomed to wear in the grist-mill, in the granary, and never had them in the house. After Mary's death the house, which was a log house, was thoroughly whitewashed, walls and ceiling, floors scrubbed with copperas-water, sulphur burned times without number, bromo-chloralum, carbolic acid and chloride of lime were used until the house was supposed to be thoroughly disinfected. Dec. 15 Frank returned to his work at the mill for Mr. Cummin. Dec. 16 there was an entertainment in the school-house. Frank attended, and accompanied Miss Libbie McCall home. Dec. 21 a child of Mr. Cummin, with whom Frank was boarding, came down and died Dec. 27. Dec. 27 Miss Libbie McCall was taken sick.

Mrs. Ellen Foley and Frank Green assisted at the death and funeral of Mr. Cummin's child. Mrs. Foley disinfected her clothing before going home to her mother's, where her daughter, "little Katie," had been about a week. Cummin's child was buried Dec. 28. Mrs. Foley returned home Dec. 29, and I was called to see little Katie Jan. 1, 1882. She died Jan. 6.

Now, did Frank Goward take diphtheria from those friends from Bay City? and did little Katie take it from the mother or from the house?

The order of occurrence of the cases was as follows:—

List of Cases.

Frank Goward, taken Nov. 13, discharged Nov. 20.
Mary Green, taken Nov. 21, died Dec. 2.
Anna Goward, taken Nov. 22, discharged Nov. 27.
Ellen Foley, taken Nov. 26, discharged Dec. 3.
Wm. Green, taken Nov. 28, discharged Dec. 5.
Frank Green, taken Nov. 29, discharged Dec. 6.
Cummin's child, taken Dec. 21, died Dec. 27.
Libbie McCall, taken Dec. 27, discharged Jan. 2.
Little Katie Foley, taken Jan. 1, died Jan. 6.

Dr. C. W. Marvin, of Ithaca, wrote the following letter on Dec. 19, 1881:—

In reply to your letter of Dec. 14, 1881, in regard to diphtheria in this vicinity, I would say this township is a new one, and at the geographical center of the county, and contains four sections two miles square.

There has been no severe case of diphtheria in the township since its organization. There was a mild case in my own family, the boy only in bed one night and to 9 o'clock the next forenoon. No other children have taken it from him.

The disease has been most prevalent north-east about four to six miles, in the township of Emerson. There were some six deaths there before the cases of the disease came under my care. There are no cases there at this time, and no deaths after I took charge of the cases. Rigid care was taken to bury all discharges several times a day; not to allow children to come to the houses. The houses were aired and fumigated with burning sulphur. I think there will be no more severe cases. One family has had diphtheria south-west 2 miles, but in another township, but there was no death and no spreading to other families. I am very thankful for the documents you sent, and will make good use of them. What is the experience of reporters, that the cause of diphtheria may lie dormant in a house once having severe cases, and then in three or four years break out again from the dormant cause becoming active? I would say four years ago diphtheria prevailed in this part of the township, but houses that had the disease in three or four years past do not seem to be more liable to the trouble, but rather the reverse.

I feel very confident the disease will subside without any more severe cases. The board of health of the township of Emerson are preventing public funerals, and children with diphtheria from going to school or out on to the highway. or other children coming to the infected house.

On February 11, 1882, Dr. Marvin wrote:—

Whenever we have a warm spell of weather diphtheria breaks out in Emerson township, where it prevailed first in 1877, 1878 and 1879, and seemed to have been wafted there by south-west winds advancing about three or four miles a year.

I know of but one case, that of a young woman of twenty, seamstress, *that went to a house that had the disease in 1878 and in December, 1881.*

I consider very cold weather and hot summer weather have a tendency to arrest the disease. Last week there were more cases, but mild.

On February 20, 1882, Dr. Marvin wrote:—

This week I have to report diphtheria broke out in a family that lived in an old log house about one year, with filthy surroundings for the last ten years, where in October, 1878, a large family of children had the diphtheria severe. Present occupants, not too cleanly, said their children had not been where they could get the disease. My opinion the old rotten logs of the house and chip-pile about caused the disease.

In the above case the germs of the disease might have lain dormant for the period from Oct., 1878, to Feb., 1882.

Dr. H. McColl, health officer of Lapeer, on Feb. 11, 1882, reported diphtheria as follows:—

Diphtheria in two families. *First.*—Hired girl in good family was sick a number of days. Complete isolation. Improved, and was removed to her home some seven miles out. Rooms disinfected. No new cases there. Have received no report of her condition since she went home. *Second.*—Mr. R. aged 60, daughter, aged 20, and wife, in one house. Mr. R. and daughter are convalescent. Wife not very sick; still has patches in throat. Same means as before adopted.

We have difficulty in getting physicians and householders to report. We shall call the attention of both to the law on this subject in the issue of our press next week. We supply physicians with blanks.

Wm. Brice, health officer of North Shade, Gratiot county, shows in the following letter, dated Feb. 22, 1882, how they abated diphtheria in that township:—

In answer to your enquiry in the cases of diphtheria in my jurisdiction, would say: I as health officer, and also the board of health, have used every restriction as soon as we heard of a case. I reported to you seven cases, two of which died. We ordered the patients isolated and disinfectants used—sulphur, tar, and other disinfectants. Those that died were removed at night to an out-house away from the family, and were buried next morning without any ceremony whatever. Just as few as were necessary went and buried the dead. As soon as the bodies were dead the clothing used was immediately taken out of the house and was burned. The cause of the patient's taking the disease in a measure is unknown. The oldest girl was away from home and was taken sick; was fetched home; the others took the disease. We closed the school and kept the patients isolated, and also the families, and used every caution in our power to stop the spreading of disease. We used the same caution in the other cases. The last case was in January, 1882, a young lady. She was kept away from all the family but tne father and mother. She was the only one in the family of five that had diphtheria. I have distributed the documents. There are no cases of diphtheria in my township to my knowledge at present. I am thankful for your instructions, and hope the disease is abated.

Dr. Henry K. Lathrop, health officer of Royal Oak, on March 6, 1882, wrote describing an outbreak, in which diphtheria seemed complicated with scarlet fever, as follows:—

Yours making inquiries concerning the sickness in this vicinity was received this morning. In reply, I would say that it seems to me many of the cases have been very peculiar, so much so that it was very difficult to name some of them. The first case in this town that I can hear of, was in the family of George Purdy. I was called to their house on the morning of Jan. 26. I found two patients sick; a young man aged 23, with diphtheria plainly and distinctly marked; he recovered. The second patient, a little girl about (I think) 8 years of age. Her parents told me that she was taken sick the afternoon before while at play, lay down upon the floor and commenced vomiting; was sick all night. I found her with temperature 103°, respiration very difficult to count it was so short and rapid, the pulse very feeble and 160 or upwards, it constantly changing. She was vomiting constantly a dark fluid, the fauces were a dark purple which extended forward from the palate one-half way to the teeth. There was visible upon the chest a faint eruption resembling scarlet fever. The child was delirious, and evidently sinking. She died before night. I was puzzled to decide whether it was diphtheria or scarlatina, or both. The young man had no eruption. The next day the mother complained of very sore throat. She had diphtheritic patches on the throat. She had had scarlet fever previously. The 28th the second child was taken while at play the same as the other, with vomiting. I was called immediately; found it delirious, throat diphtheritic plainly. Called Dr. Post in consultation. The fourth day the child became as red as a lobster, showing scarlatina plainly, also diphtheria. It died the fourth day. I was taken sick with severe chills, followed by fever, and had to retire from the cases. The third and last child was taken the next day in the same way, I learn, and died in 14 hours. Mrs. Purdy also had a miscarriage. This finished the children in the family. I think the young man and Mrs. Purdy had diphtheria, the children both diseases, diphtheria and scarlet fever. Two miles below, a family of seven members were taken. The woman had been to Purdy's. Three of them were well-marked cases of scarlet fever, the rest of them a sort of malignant sore throat with no eruption. All recovered. The next cases in this town were four miles from the others, and were under the care of Dr. G., who refused for some time to report, although he now has, to the clerk, who is now out of town. He had three cases; all died. The next cases were in this village. Four more died, making so far 10 deaths. As far as I know, all that died had the eruption. A large number were sick with a sore throat and high fever. All symptoms the same except the eruption. Should the sore throat cases have been reported, and if so what should the disease have been called? Some of them had abscesses of the throat, breaking some outside, some inside. We have reported the cases that showed diphtheritic patches and no eruption, as diphtheria. Those that had the eruption and no diphtheritic patches as scarlet fever, and those that had simply the sore throat and fever without eruption or diphtheritic patches, we have not reported at all. Should they be reported? If so, tell what we should call it.

Of the origin of the disease, Mr. Purdy has no idea where the contagion came from; many of the others the same way. I have had, including the sore throats, about 20 cases; excluding the sore throats and taking those that were plain, say about 7 or 8 in this town.

I have been confined to the house from the effects of a sun-stroke last summer, so that I have not seen as much as some others of the disease. The deaths reported to the clerk from the disease he says are ten.

The measures employed to restrict the spread of the disease were these: All schools and protracted meetings closed in neighborhoods where the disease existed. Two hundred copies each of the documents of the State Board of Health, on scarlet fever and diphtheria, purchased and distributed through the town; also have had them publicly read in churches.

The disease seems to be about checked, but we fear it may start again. They shed the cuticle the same as in scarlet fever when they recover.

The question of reporting cases of sore throat during an outbreak of diphtheria is one which has received the attention of this Board, and the expressed opinion of the Board is that in cases of doubt as to the true nature of the disease it is desirable and important to give the public safety the benefit of the doubt, and report the cases.

Dr. J. A. Guthrie, of Ithaca, on March 15, 1882, reported an outbreak of diphtheria where it seemed to have been spread by one school visiting another. His letter follows:—

In the school district west of the one where diphtheria now prevails, there were some cases, and school was suspended about two weeks, and then resumed. After about two weeks the schools visited each other, and a short time after, diphtheria appeared in the east school in six families, all the cases scholars that were at school at the time of the visit from the west school. None seem to have been affected by going to the west school, as that visit was made a week first. There were ten cases in six families in different parts of the district, all within three days.

My theory is that the houses and clothing in the west district had not been disinfected; the clothes worn by the scholars every day had become disinfected, so that at their own school they did not communicate the disease, but when they visited the east school they put on their best clothes that had not been worn and aired.

I have attended nineteen cases, and there have been seven other cases, or it is said there have been, but none have been reported.

Three deaths, one my patient; one from too long use of the druggist's "sure cure," and one from *change of physician.*

It has been difficult to adopt any regular means to restrict the spread of disease in the families where it started. The houses are small, or no means of warming other rooms, so that the patients and family cook, eat and sleep in one room, and of course all have the disease, sometimes two, three or four, and one case six; but it has not spread to other families, only one family having been affected except the first taken. I have found but one house where I could get isolation and ventilation, and there I have had only the first case that proved very hard, but recovered, so that I think whole families need not have it if attention is paid to the rules of the State Board. I have had a large supply of circulars, and have distributed them well over the township, and I think they have done much to prevent the spread of the disease.

Dr. Geo. W. Orr reported, March 13, 1882, the first appearance of diphtheria in Keweenaw county, as follows:—

Diphtheria is a disease *heretofore unknown to this country*, and some of the old physicians doubt very much that there has been any diphtheria here, therefore I have concluded to report the cases to the *Physician and Surgeon*, of Ann Arbor, in a short time. I know that I have had nine cases of that disease since Nov. 16, 1881, with two deaths from the acute disease and one from membranous croup, a few days after recovering from diphtheria. I cannot see why that disease should be exempt from this country; on the contrary it seems to me that the surroundings are favorable to the development of that disease at this season of the year This season the snow came in November, and the ground has not been uncovered since, averaging one snow-storm each week during the latter part of November and the most of December. We had considerable warm weather, thawing and freezing and snowing occasionally. In many instances two large families live in one small house, both depositing all the waste and slops at the back door, where it mixes with the snow, freezes and thaws as the weather favors. Usually it remains frozen until April, when the snow is from four to six feet deep. Then the sun comes out warm, thaws, and the water leaches through to the bottom and runs off, leaving the vegetable and organic matter to decompose, which must have some influence on the health of those who inhale the vapors. This is what we call a Lake Superior break-up, lasting from one to two weeks, and my experience has been that we have abundance of throat trouble at that time, as well as an increase in other sickness. During the latter part of November and the whole of December, we had an unusual amount of throat trouble, due, I believe, to the thawing days and freezing nights and the decomposing filth around the doors of houses. The first case that developed membrane I believed at the time to be accidental, and called it diphtheritic pharyngitis. This was a spare anemic girl, 12 years of age, with a history of pulmonary consumption on father's side. A few days before she was taken with throat trouble she had quite severe diarrhea, which reduced her strength very much. The membrane was thick, and covered tonsils, dipping down into larynx and involving posterior nares, reappearing after being detached, with a profuse ichorous

discharge from nostrils, excoriating lip. Her pulse was imperceptible at the wrist, the most of the time temp. from one to two degrees below normal. The last three or four days the throat was improving nicely, and I was in hopes she would rally, but she was too weak and took too little nourishment, and died from exhaustion December 1st. There were five other children in this family; all had pharyngitis, but no membrane

The next case was a robust, vigorous girl of 12. This was as typical a case of malignant diphtheria as any child ever suffered from. She was taken with the disease on December 28th and died on the 31st. The houses of these two cases *were not thirty feet apart*, and two brothers of the last case were very sick with the disease, but both recovered.

The next case was over a quarter of a mile from the Bennett and Craze families. A German boy 10 years of age. Recovered.

The next case was in the large boarding house; Libbie R., aged 11 years, was very sick with the disease, but after several weeks she made a good recovery. Her little brother Stephen was not so fortunate as to result. He had the disease very mild, and had apparently recovered; was taken with membranous croup and died from suffocation. The other cases were quite mild and made good recoveries. We have a great many pack-peddlers in this country, and I am confident they peddle diseases as well as goods.

Dr. Wm. E. Dockry, health officer of Pentwater, shows in the following letter, dated March 24, commendable energy in abating diphtheria:—

The last case of diphtheria was reported Dec. 15, 1881, and reported recovered Dec. 31, 1881. The quarantine was not removed from said premises until Feb. 1, 1882, because there remained four in the family that escaped. The house was thoroughly disinfected by sulphur fumigations, solution of carbolic acid, all clothing destroyed, etc., etc. There was thorough isolation in this family from neighbors, and in fact no one visited them but myself. These cases were reported to you in last year's report. All recovered.

Dr. H. J. Hale, health officer of Grass Lake, Jackson county, reports diphtheria brought from Chelsea to a point some twelve miles distant, by a woman. His letter, dated April 2, 1882, describing his methods of preventing its spread, is as follows:—

Diphtheria was communicated by direct contact. The aunt, who was visiting at Gray's, came from near Chelsea, and I think was at Wallace's or near there, and I have heard that the disease was very fatal in Wallace's family. While she was at Gray's I was called and found her suffering from diphtheria. Up till that time the child had slept with her.

Willie Gray died. I ordered immediate interment; no funeral; thorough disinfection by sulphurous acid gas and chlorine; everything used around the child such as rags, etc., to be burned as soon as used; excrements to be destroyed, that is buried; no kissing or inhaling of breath; isolation of other children as far as possible (there are three others in the same house and no outbreak of the disease as yet).

If filth in yard or house or around premises has anything to do with diphtheria or scarlet fever they would all have it in this family, and 20 per cent of our German and Irish population would have the disease; but I don't believe it has, and for all that's written and said in regard to that source of contagion I believe two thirds of it is theory and the remaining third —— ——. We have had diphtheria in all its forms, epidemic, endemic, and sporadic, in the houses of the wealthy, where from cellar to garret cleanliness was next to godliness, where all the rules of hygiene seemed to be carried out, ventilation excellent. It has commenced in these very houses without any known cause, and remained in that class of houses and the little ones have tottered across the floor to their mother's lap and died, while families directly opposite, houses swarming with children, have escaped entirely. In this family of —— there is one more child, a nursing babe. My experience is that nursing-children will not take the disease unless the mother has it, and then they will. In the next room lives another Irish family with two children, mother, and grandmother. Nastiness everywhere, pigs, geese, dogs, ducks, and fowls of all kinds. The yard is a veritable guano bed. No more diphtheria there. My idea to prevent the spread of this disease, especially in families, is instant and complete isolation, out of the house, off the premises. I have tried it and succeeded.

Dr. A. S. Martin, of Texas, Kalamazoo county, wrote the following letter, April 3, 1882, which is interesting, especially because of the hypotheses of contraction of the disease:—

In regard to the present outbreak of diphtheria in this township I would say: The first case originated in the person of Mrs. Fellows. Mrs. Fellows had not been away from her house for two weeks previous to her sickness. No person had been there who had been near any case of diphtheria, as far as known. Two weeks ago, however, Mrs. Fellows was out riding, and passed a house

where a child had lately died with diphtheria. (The child had been buried about *two weeks before.*) Further than this, I am assured that there could have been no possible exposure. All necessary precautions have been taken to prevent the disease from spreading. No children have been allowed to enter the house since the outbreak of the disease; sulphur has been burned daily in the house; a solution of carbolic acid has been used to sprinkle the floors and walls, and all cloths used to absorb discharges have been promptly burned. All discharges from the patient received in vessels have been emptied into the privy-vault and dry ashes thrown in upon them. (They were first disinfected with a solution of carbolic acid.) The case was mild, and the lady is now convalescent. There are two children in the family, but neither have, as yet, shown any symptoms of the disease. At Mr. Lapham's, just one mile west of Mr. Fellows, there are two children down with the diphtheria. Their ages are two and six respectively. The sanitary surroundings at Mr. Lapham's are good. The same means of disinfection are being used as were used at the house of Mr. Fellows. The cause of the infection of the children at Mr. Lapham's is not known. The children have not been away from home for two months, no one has been to the house from infected localities. The outbreak of diphtheria at Mr. Fellows' occurred on Sunday, March 26. At Mr. Lapham's on Wednesday, March 29. There has been no communication between the two families for some time. Perhaps the outbreak of diphtheria may be attributable to atmospheric influences. The day before it made its appearance at Mr. Fellows' the weather was cold, raw, and disagreeable. Sunday morning the wind suddenly shifted from the north, or north-west, to the south, and the weather at once became very warm and sultry, so much so that it became oppressive, making respiration difficult in the most healthy. Sunday afternoon there was a warm rain, and Sunday night the wind shifted back into the north-west, and it become at once cold and disagreeable. As a result of the sudden changes almost every one took cold, and complained of sore throats. The large amount of ozone in the atmosphere may have irritated the air-passages of all, at least the complaint was general. This hypothesis may account for the present outbreak. There are but three cases of diphtheria in the township at this writing, and hopes are entertained that it will not spread. In the township of Oshtemo, which joins us on the north, *diphtheria* seems to have got quite a start, and it may yet be proven that from that source arose our cases which prevailed in this town. The house spoken of as the one which Mrs. Fellows passed previous to her sickness was situated in that township, and cannot be over two miles from Mr. Fellows, and not much further from Mr. Lapham's.

Dr. E. H. Ryno, health officer of Wayland, Allegan county, reported an outbreak of diphtheria imported from Kalamazoo, in the following letter, dated April 3, 1882:—

Diphtheria was *brought to this place* last October by a child from Kalamazoo, which had had diphtheria some weeks before, and still had a discharge from the nose, but it was thought nothing of by the parents. There were four children in the family where the child was visiting. They all became ill about the same time, and one died. The attending physician did not report them, and said it was not diphtheria. Several weeks after this a girl went to board at said place, and was also taken with the disease and died. The case not being reported, and the physician still saying it was not diphtheria, caused the people to lose sight of it (all this occurring a couple of miles out side of the village), and we heard nothing from it until in February, when a family moved in a house directly across the street from said family, and having occasion to go in, became infected with the disease, a 16 years old boy being the first. He, after five days illness, died, the same physician treating him that treated the others, and he still declared that it was not diphtheria. A girl 14 years of age was the next to have it. The family, becoming alarmed, sent for me. I placed the rest of the family under treatment, as well as the girl, who recovered with the loss of her voice for several weeks, and her sight somewhat impaired. The mother had a light attack, but made a quick recovery. The physician having them in charge at first went directly home from the boy that died, and there being a little girl residing with him, she also became infected with the disease, and after five days illness died. He being determined to hold to his old opinion that it was not diphtheria, did not let any one know that the child was sick until the mother, sister and brother, as well as many others, were exposed. I saw the child two hours before it died, and isolated all that were exposed, and placed them under treatment. Mother and sister came down within a few days, and had the disease very severe; the brother had a light attack; they being the ones that were most exposed; the others did not have it. We think we have the disease under complete control.

This is the result of my inquiries as to the source of the contagion. We had in all 12 cases and 4 deaths.

Dr. Robert Henderson reported on April 15, 1882, two cases of diphtheria in Dayton, as follows:—

The two cases of diphtheria reported to you by myself were brought here in this manner: Mr. N. and wife, of Grand Rapids, Mich., had a girl two years old sick with malignant diph-

theria First one parent and then the other carried it day and night until it died. They brought the body in the cars to Buchanan, Mich., and buried it in the cemetery there. They visited friends south of Dayton for a few days, and finding their throats swelling in the night, started for train the next noon, and while in this village waiting for the train called at my house and I prescribed for them. Immediately after they left for Grand Rapids. The wife had a temperature of 102.5°, husband 101.5°, throat badly affected with a dense ash-colored deposit, with characteristic smell, etc. You can find out more by writing to Grand Rapids as I heard nothing more of them. I have two children, one 9 years the other eighteen months old, and I feel uneasy. The physician who gave them a certificate or allowed them to take the child on the train is a good subject for the law if it is no dead letter, as you say it is not.

Immediately on the receipt of Dr. Henderson's letter, a letter was written to the clerk of the board of health of Grand Rapids, questioning relative to the granting of a permit for the removal of the dead body referred to. The following reply was promptly received from Dr. Maxim, the clerk:—

Regarding the permit given Mr. N., it was granted by me with the sanction of Mr. Doornink, of this board. The facts are these: Mr. N.'s child died April 3, 1882. The body was well disinfected and embalmed. The coffin was made close by putting a strip of tarred paper between the top and bottom and the sides, and disinfectants were put into the case. Mr. and Mrs. N. fumigated the clothes worn to Buchanan as well as their residence, before starting. After the burial, in coming from the grave they got very wet, it raining hard, and both took severe colds, and the next morning their throats were sore. They consulted a physician at Dayton, who told them it looked like diphtheria and advised them to hasten home. He gave them a carbolized gargle which they used freely before going on the train. The sore throat lasted for two days when it entirely disappeared, neither of the parents being sick enough to keep the house or quit their usual occupation. No other child in Mr. N.'s family contracted the disease.

These are the facts as I know them at the time from personal observation, and have to-day gathered from Mr. N. and Mr. Durfee, undertaker in charge of the case.

No report of any subsequent cases at Dayton has been received, so it would appear that the disease was not spread as Dr. Henderson feared it might be.

George J. Ambrose, health officer of Monroe township, Newaygo county, wrote the following letter, dated April 22, 1882, illustrating the difficulty some boards of health have through their not being able to secure the services of a competent physician:—

During the summer and fall of 1881 and this last winter, *diphtheria* has been raging in our town very considerably, so much so that there have been two or three deaths weekly, and also among adults to some extent. Our village is only a small lumbering town 12 miles south of Big Rapids, with a population perhaps of less than two hundred, all of which are employed in the one mill. I do not find any records of this fatal disease being reported to your office, but would say that 25 or 30 children must have died with it here, and I am sorry to say it has again broken out in the village, five cases being now reported to me, and two deaths this week, all children. This day it is reported to me by neighbors that two adults are down with it. I have called upon them, forbidding them to allow any communication with others, but it is almost impossible to carry this out in the village, for the mill must run, and the heads of the family thus infected have to work, and I am much afraid it must spread to a fearful extent again among our children if some way is not provided to shut it down. We have no physician in this village, but in the town of Hungerford a Dr. De Groat, who is attending some of the cases, and who at present has not reported the whole cases to me under his care, but those patients who are under his care he does not pronounce diphtheria, but membrane croup, and two children died within 24 hours of each other in same family. Dr. Breckon, who is not in our township, but still in the village of Woodville, has had many of the cases, and many recovered, and some he lost. They sent to Big Rapids for physicians, who seem to have no better success with the cases in this place. Our village is low and swampy, and decayed pine logs are left when the best pine is cut off the land.

Dr. John E. Gruber, health officer of Hinton township, Mecosta county, wrote a letter, dated May 18, 1882, which is interesting because of the source of contagion:—

I have had a few interesting cases of diphtheria recently, the peculiarity being the supposed source of disease. Cases, James P. and wife.

Supposed source: About one year previous to their attack Mr. P.'s brother's family had diphtheria, in which he lost his wife and only child. After they were buried the house was disinfected (so they say) thoroughly by burning sulphur and closing it up closely. All the bedding and other

clothing were washed and put away in a trunk. After everything was put into the trunk then a doll was discovered, which the little boy, who died, had been playing with, and it was placed in the trunk with the clean clothing.

About a year from that time Mr. and Mrs. J. P. went to remove the clothing from the trunk for the purpose of airing them, and they say that a terrible stench arose from the trunk when first opened. On the ninth day from that date Mr. and Mrs. J. P. both were attacked with diphtheria, mild form, and made good recovery. Restriction about the house at time, perfect cleanliness and an abundance of chloride of lime.

Dr. H. H. Chase, then of Linden, Genesee Co., reported in detail 59 cases of diphtheria, of which 42 cases recovered (71.18 per cent), and 17 cases died (28.82 per cent). He determined the incubation period in 25 cases, as follows: 3 days, 1; 4 days, 1; 5 days, 5; 5 to 10 days, 1; 6 days, 1; 7 days, 3; 9 days, 2; 10 days, 2; 11 days, 3; 14 days, 5; 30 days, 1. Twenty-three cases were mild, 19 typical, and 17 malignant. Of the 23 mild cases, one died; of the 19 typical cases, 3 died; of the 17 malignant cases, 13 died. In 8 cases paralysis of the muscles of the throat followed. With the exception of 3 places, all the localities where the epidemic appeared were within a radius of 2½ miles from a common center.

In 43 of the cases the source of the disease could be traced to direct contagion. Four of the cases were infected by a nurse from a previous case whose physician said diphtheria was not contagious. Seventeen of the cases were the indirect result of an ignorant quack who called the disease non-contagious. One was infected at school, which was afterwards closed. The ages varied from three months to 78 years, the deaths were, however, among the younger persons, there being one death at 3 months, 1 at 2 years, 2 at 3 years, 1 at 4 years, 2 at 5 years, 1 at 7 years, 1 at 9 years, 2 at 11 years, 3 at 13 years, 1 at 19 years, 1 at 21 years, and 1 at 23 years. Of the 17 who died, 7 died from paralysis of the heart, 7 from asthenia, and in three the modes of death were unknown.

Dr. S. J. Hutchinson, of Northport, Leelanaw Co., reports the introduction of diphtheria by Germans lately arrived at that locality, in the following, from a letter dated June 25, 1882:—

To-day I have been hurriedly called upon for the first time to visit a child apparently moribund with diphtheria, which I believe to be the disease. It is the first case I remember to have ever known to come under my treatment here in this very healthy locality. Other members of the same newly arrived German family have been down with sore throat for four weeks or more. I now learn the German family have been here six weeks, or so they tell me. Case evidently imported. Will verify disease to-morrow.

Dr. A. P. Drake, of Hastings, wrote on June 26, 1882: "A year or two ago you asked if I considered the diphtheritic patch as essential to a diagnosis. I replied in the affirmative. I now wish to take that answer back, as I am well satisfied that I have seen the disease without any false membrane whatever."

Dr. O. W. Shepard, health officer of Mendon, St. Joseph Co., reported two cases of diphtheria in a family which moved into a house in which diphtheria had been present the year before. He practiced isolation to prevent the spread, with complete success.

Dr. Bion Whelan, health officer of Hillsdale, reports an outbreak of diphtheria in the following letter dated July 19, 1882:—

We have had four cases of diphtheria in this outbreak. The source of contagion was from constant and repeated exposure for the first case, a boy, from wading and playing in a creek near by, the other children coming down afterward. We had no deaths. All cases were isolated; public notice given, as per the ordinance of city council, just passed, which I now enclose; and distribution of revised document on diphtheria to all the families in the neighborhood. We kept the disease in the house it started in, although all the children in the house came down with it. At the present time we have two cases, both convalescent.

The ordinance referred to by Dr. Whelan is as follows:—

An Ordinance Relative to Contagious Diseases.

The Common Council of the city of Hillsdale ordains:—

SECTION 1. That no person sick with small-pox, scarlet fever or diphtheria shall attend any church, school, or assembly of people within the city of Hillsdale while so sick, or for a period of twelve days after his or her recovery, without the written consent of a competent physician, or the health physician of said city; nor shall any person having the care of any person sick with any diseases mentioned in this section, attend any church, school, or assembly of people while so employed, or for a period of twelve days after the recovery or death of such person, without the written consent of a competent physician, or the health physician of the city.

SECTION 2. It shall be the duty of every householder, knowing that any occupant of his or her house or premises in said city is afflicted with any of the diseases mentioned in section one of this ordinance, or the attending physician in such case of sickness, to cause a sign of warning to be so placed on said building or premises as to be seen and read by persons approaching said house or premises.

SECTION 3. No physician or other person, while attending any person sick with any disease mentioned in section one of this ordinance, shall attend any patient afflicted with other diseases without first informing such patient, their custodian, or legal guardian that he is in attendance upon a patient afflicted with such contagious disease.

SECTION 4. In case of the death of any person in the city of Hillsdale sick with any disease mentioned in said section one of this ordinance, no person or persons shall move, or cause to be moved, the body of such deceased to any church, hall, or other place in said city, for the purpose of holding a funeral, but the same shall be buried as soon and with as little display as consistent with decent and proper usage, and no child under the age of sixteen years (except members of the family or household), shall attend such funeral or visit such house or place during such sickness or funeral.

SECTION 5. Any person or persons violating the provisions of this ordinance shall, upon conviction thereof before any Justice of the Peace within and for said city, be punished by a fine not to exceed twenty-five dollars and costs of prosecution, and in default of the payment of such fine and costs said Justice of the Peace may make a further sentence that the offender or offenders be imprisoned in the county jail of Hillsdale county until the payment thereof: *Provided*, That the term of imprisonment shall not exceed ninety days.

All ordinances and parts of ordinances contravening the provisions of this ordinance are hereby repealed.

Adopted July 3, 1882. EZRA L. COON, Mayor.

ELON G. REYNOLDS, Clerk.

Dr. J. W. Hauxhurst, of West Bay City, reports cases of diphtheria in most unfavorable surroundings for preventing its spread, and one case where the contagium was carried by a physician. His letter was dated July 22, 1882:

It will be of interest to mention in detail some of the facts connected with the cases of diphtheria, as showing what may be done under the most unfavorable circumstances in combatting this dread disease, as well as to indicate the caution necessary on *the part of the physician to prevent spreading contagious diseases through his own person.* The 19th of June last I was called to see Arthur ——, age 10 years, who had been taken with a severe chill, and was, when I reached him, with unusually high fever. I did not take the temperature. Complained of sore throat, but no membrane visible. * * * * * The next day when I called the membrane was typically developed, and from this on the disease pursued a persistent and almost malignant course for two weeks. The posterior and anterior nares were rapidly encroached upon, and it was difficult all this time to keep the passage open sufficient for respiration. Three weeks elapsed before the membranes presented clean, but reddened and flabby. Convalescence has been slow, owing to renal complication, the urine being loaded with albumen, and the face markedly anemic and dropsical, both of which are gradually disappearing.

On July 1st, Alexander, a brother 15 years, came down in a similar way, and presented symptoms of a prostrating form of the disease. There was not, during the progress of this case, much pseudo-membrane in the throat, but the tissues presented a venous hue, and the swelling was deep, involving the areolar beneath the membrane. All efforts to bring down the pulse or to sustain the case failed, and the boy died on the morning of the 7th from asthenia.

The shanty in which these cases occurred is 16 feet square, about 9 feet high, built of rough lumber, and is papered inside with brown building paper. There is also a lean-to used as a kitchen, hardly high enough to stand erect in, and 7x16 feet. This part of the miserable hut is lined with the same kind of paper as the rest, only that it had been taken from a hen-roost, in which place it had previously done service for nearly a year, a fact which I did not know until a few days ago.

The largest room had, up to last spring, when the family moved into it, been used for an "ashery," or where ashes were boiled to make pearl ash. The inmates of this place were the father and mother, an adult brother of the father, the boys Arthur and Alexander, and a younger brother, five years of age, and who escaped the disease.

There is no privy on the premises, the only place used as such being one corner of the hen roost, and which is distant from the shanty about 25 feet.

In this loathsome den I have described occurred the foul disease mentioned, and to me it renders the following facts, viz.: The cases were typical and unusually severe. The surroundings and hygienic habits of the patients were miserable and loathsome. No chance whatever to isolate the inmates, they all the time occupying the same room, for practically the partition between the two was no division. Every article of bedding and clothing in the shanty was filthy to stiffness with dirt; and yet, in the face of all these discouragements, the strictest, persistent disinfection* * * * * * prevented the boy of five years, as well perhaps as the adults, from contracting the disease.

On July 3, when coming from a diphtheria patient, Dr. —— was called to hasten to see the baby of ——, whose family exemplifies cleanliness, and whose premises are likewise clean. The baby was cutting teeth and its fever was from this cause. The only one of the children except the baby who came near the doctor was little Harry, eight years, and who brought the doctor his flag. One week from that day Harry had high fever and a sore throat. The following day a large patch of false membrane spread over the right tonsil, distinctly diphtheritic in character, and fetid in the breath. No other cases of diphtheria in this or adjoining neighborhoods. Owing to the very favorable surroundings the case was easily managed. But there is no doubt about the source in this instance. In the first-named case I think the contagion was generated *de novo.*

Dr. G. W. Van Antwerp, health officer of Danby, Ionia Co., reported in July, 1882, an epidemic of diphtheria in which there were 21 cases and 10 deaths, in which the contagion was brought to the first case in clothing brought from Ionia.

Dr. C. W. Huff, health officer of Pine Grove township, Van Buren county, wrote the following letter dated Aug. 14, 1882, detailing another case of communication of diphtheria four months after supposed disinfection:—

The first case of diphtheria occurred in the family of E. Brundage, Aug. 1st, four miles north of this place. The child had not been exposed to the contagion of the disease in any way unless by people visiting at their house who had the disease in their family four months previous and had thoroughly disinfected their house and clothing. Second case occurred six days later in this town. No intercourse whatever between the two families. One other case came down in the Brundage family on the 11th day from the time the first case was taken sick. The disease is of a malignant type, second case proving fatal on the third day from the time it was first seen. First case convalescent. Third case of a malignant form, issue doubtful.

Dr. J. J. Robbins, health officer of Hubbardston, on Aug. 25, 1882, reported two cases of diphtheria, in the following letter:—

The case in question is diphtheria ulcerative. No membrane forming, proved to be very malignant. I was called Saturday. Patient died Thursday morning about 5 o'clock. Boy of eight years. As yet I can assign no immediate cause for the outbreak more than exists in a majority of premises. Two weeks before, the father came home from Chicago where he has lived for some time, but as yet there is no satisfactory proof of communication from him. A little sister of four years has the characteristic patch, but it is nearly dissipated, no fever, and good appetite. Have followed the directions as per circular of State Board of Health so far as circumstances would permit. It has not spread so far off the premises. Several cases of malignant tonsilitis in this vicinity but not recent and not nearer than four miles.

After putting the rules recommended by this Board into immediate use, Dr. Robbins communicated the result on Sept. 2, as follows:—

It is with great satisfaction that I report the disappearance of the recent outbreak of diphtheria here. Four cases all told. The first died, the second was very severe but recovered, third and and fourth mild. *It was the first time I had any practical occasion to thoroughly appreciate the helps, etc. of the State Board of Health.*

Dr. C. W. Niles, health officer of Calumet, wrote a letter, extracts from

* [The portion omitted relates to medical treatment supposed to be preventive of the disease, but not included here because no medical treatment has been permitted to be discussed in this volume. H. B. B., Sec. S. B. of H.]

which will show how active they are in attempting to restrict the disease. The letter is dated Sept. 15, 1882:—

The board of health established a pest house in the vicinity of the infected district, furnished experienced nurses, and as far as practicable removed patients to this house. The board furthermore took the precaution to place a watchman by day and and another by night as a guard over the infected district, who should see that the orders of the board were strictly carried out. The board is very prompt in its action and everything is being done to stop the spread of the disease. I most heartily second the high value in which my brother practitioners hold your health documents, such as those relative to diphtheria, scarlet fever, small-pox, etc.

Dr. Hugh McColl, of Lapeer, wrote the following letters bearing on the period of incubation of diphtheria. The first letter, dated September 16, 1882, is as follows:—

Diphtheria has appeared in two families in this place, three cases in one family and two in the other. The first family (Wurth), were visiting about eight miles north of this place, where diphtheria was, or had been, a short time previously, and *in a few days* one of the children came down with the disease, but it was not reported till a week ago to-day, when the child died. Two others were found with the disease, one of which died on Wednesday of this week. The third is convalescent, and I have disinfected the premises.

The second family (Ferguson), had two cases. The first, a boy, visited the *Wurth* family on *Friday, 8th inst.*, and *on Sunday following* the disease developed. Was quite mild, the second case coming down on *Tuesday*. They are convalescing and under observation.

The second letter is as follows:—

I have endeavored to ascertain the length of time from the exposure in the first case of diphtheria in the *Wurth* family to its development, but nothing definite can be learned, only *it was three or four days*. They could not tell distinctly.

It is sometimes difficult to secure notification of the existence of diphtheria from the physicians and householders, especially as the law requiring contagious diseases to be reported does not name diphtheria. The following letters bear on this difficulty. They are from Dr. D. M. Bennett, health officer of Port Huron. The first one, dated Sept. 28, is as follows:—

Every case of diphtheria that has come under my notice was in low, damp localities. There have been 17 cases as far as I can learn, with thus far only 4 deaths. I have prevented public funerals, and caused the infected houses to be thoroughly disinfected. I am inclined to think that we have it under control, but two physicians have refused to report, and that is the cause of its getting scattered over the city. I have made complaint, but our prosecuting attorney does not want to take action in the cases, and at the present time I am unable to say whether I will be able to accomplish anything or not. So far as I know, only 8 cases at the present time.

The same day Dr. Bennett wrote:—

Since writing you this morning I have seen our prosecuting attorney, and he said that I had better not try to prosecute these cases referred to in my other letter, as it *was a question whether I could get a jury to say that diphtheria was a contagious disease*, and he claims that the law does not so recognize it under the statute. So you see I am powerless to get a full report of contagious diseases, but will do the best I can under the circumstances.

Later, Dr. Bennett wrote as follows:—

I will give you a further report of diphtheria in the city at the present time. I discharged 5 cases yesterday cured. There are now, so far as I am able to learn, 6 cases under treatment, all in a fair way of recovery, and only 5 deaths so far, one to-day I have used every precaution possible to prevent the spread of the disease, and think I shall succeed in stamping it out entirely. The little tilt I had with two of our physicians, for not complying with the laws, I think has resulted in good. Will keep you posted.

From all of the foregoing letters it seems to be plain that diphtheria can be suppressed by prompt and intelligent action by the health authorities, wherever such health authorities are properly sustained by the coöperation of intelligent citizens.

Diphtheria still seems to be the communicable disease most to be dreaded in Michigan; therefore there is need of continued effort on the part of the State Board of Health, of the local boards of health, and on the part of the people generally, in order that "prompt and intelligent action by the health

authorities, properly sustained by the coöperation of intelligent citizens," shall be the rule throughout this State, and thus ensure the rapid and complete suppression of diphtheria whenever a case occurs, and so reduce to a minimum the sickness and deaths from this disease. As one means of securing such intelligent action on the part of all the people throughout the State, the State Board of Health has, during the year, distributed gratuitously a large number of copies (about 45,000) of the revised document of 1881, giving directions how to restrict and prevent diphtheria. These were in the English language. Copies of German and Dutch translations have also been distributed. In order to enable local boards of health and others to readily supplement the effort by the State Board to enlighten communities on this subject, the State Board has had the revised document stereotyped, and thus ensured that the document in a correct and reliable form, may be purchased, at prices which are made public, by any person who wishes to use it in numbers or ways in which the State Board is unable to distribute it.* It is earnestly hoped that many will coöperate in this effort to lessen the ravages of a deadly malady.

SCARLET FEVER IN MICHIGAN—YEAR ENDING SEPTEMBER 30, 1882.

This disease is not nearly so common in Michigan as it was in 1870, '71, '72 and '73, before this State Board of Health issued its document on the restriction and prevention of scarlet fever. Copies of that document were sent to every school district in Michigan. The local health authorities in this State now know better how to control scarlet fever, and, under the stimulus of the State Board, local health officers are now quite generally appointed, and it is rare that an outbreak of scarlet fever is allowed to spread, as was formerly the case, in this State. During the fiscal year ending September 30, 1882, letters and copies of the document telling how to restrict this disease, were sent to about 150 places, where scarlet fever was reported in some manner to be present. To many of these letters official replies were received, stating the rumor or report to be false. Undoubtedly cases occurred which were not promptly reported to the State Board. Eighty-two localities reported a total of 284 cases and 48 deaths. The highest number of cases reported at one place was 20, at Monterey, where five deaths occurred, and the highest number of deaths was 8, at Jamestown, where the disease was introduced by immigrants, and there were 15 cases. Twenty-two localities succeeded in restricting the disease to the first case, while many had only two or three cases. Copies of a revised edition of the document issued by this Board, relating to the restriction and prevention of scarlet fever, have been freely distributed, and it is known that by following the recommendations of this Board contained in that document, outbreaks of scarlet fever have been prevented from assuming such disastrous proportions as was formerly permitted.

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* Copies may be obtained of W. S. George & Co., of Lansing, Mich., at the following prices, cash to accompany the order:—

100 copies for	$1.75	400 copies for	$4 25
200 " "	2 50	500 " "	4.75
300 " "	3.50	1,000 " "	8.00

The order should state whether they are wanted in the English, the German, or the Dutch language.

SOURCES OF CONTAGIUM OF SCARLET FEVER.

The evidence on this subject contained in the following reports may be summarized as follows:—

In one case reported by Dr. Wellings the disease was believed to have been contracted in Detroit. E. O. Smith reported one person taken with scarlet fever who had just returned from Canada. A case was reported by Dr. McColl to be taken sick Dec. 21, 1881, with no known chance for exposure except living in the house where a light case occurred in July, 1881, which presented symptoms of scarlet fever, but was not under the care of a physician. Another series of cases spread from a family where the disease occurred but was not reported. In two cases there was a chance that the disease could have been introduced in relief clothing sent to the Huron peninsula after the great forest fires in September, 1881. In one case it was probably communicated by a physicion who was treating scarlet fever in another family. To one family it was believed to have been brought by clothes from a washerwoman's where there were cases of scarlet fever. In one outbreak the source could be traced to no other source than the father of the two cases, who was a traveling man, often going on railroad trains. In one case it was believed to be communicated by money from immigrants. In another instance immigrants just arrived from Holland and sick with it, introduced it in one locality, where there were 15 cases and 8 deaths. One person in Otsego contracted the disease in Muskegon. Dr. Moor says in one outbreak the disease was supposed to have been contracted by the first case by riding past a house where a child had died in the night and the bedding was hanging outside, or in a store the same day in which two men had been who had just before buried the dead child referred to. This was on Feb. 2. The child thus exposed was not taken sick until Feb. 25. One case is supposed to have had its origin in the clothing or bedding, there having been a case in the family about a year and one-half before. Dr. Backus reported a case in a family in which the disease had been two years before. Dr. Clapp reported a case of a little girl who had scarlet fever; no source known except that she had free access to a house where scarlet fever had occurred about eight months before.

PERIOD OF INCUBATION OF SCARLET FEVER.

Dr. Wellings reported a case in a child which had visited Detroit 10 days previous to the attack. Dr. Moor reported a case in a boy who six days previous to his attack visited a school in a district where there was scarlet fever. He also reported a case where the period of incubation could have been seven or eight days, and one where, if the supposed source of contagion was the real source, the period of incubation was 23 days. Dr. Northup reported a case where a doctor, who was called to vaccinate, was treating scarlet fever patients in another family; in nine days those whom the doctor vaccinated had scarlet fever. Dr. McColl reported a case where a boy was taken sick 14 days after attending a picnic.

REPORTS OF OUTBREAKS OF SCARLET FEVER, AND ACTION BY BOARDS OF HEALTH IN RESTRICTING THEM.

Dr. O. C. Williams, health officer of Muskegon, wrote as follows on Dec. 3, 1881:

I have received 25 copies of the documents on the prevention and restriction of scarlet fever, for which accept many thanks. They are good and will be wisely distributed. We have had seven cases of scarlet fever but no deaths. We have a police board who are prompt and effi-

cient. No diphtheria has been reported since the 7th of last month. One doctor has been arrested and fined for non-compliance with the health laws, also one milk-peddler was required to stop selling milk. The slaughter houses and meat markets are inspected once a week in cool weather, in hot weather daily.

Dr. Geo. W. Rice, health officer of Hudson, reported a case of scarlet fever, Dec. 20, 1881, contracted from a person who had been exposed but was not sick with the disease.

Dr. J. H. Wellings, health officer of Lansing, wrote Dec. 25, 1881, as follows:—

I have one case of scarlatina in the family of H. C. H., in first ward. Must have contracted disease while visiting in Detroit 25 days previous to attack. I have the family cut off from the public entirely, not even permitting them to send a letter from the house. I shall wait anxiously the result of these two cases, as I think they will test the isolation and disinfection pretty well.

Dr. Wellings subsequently reported more particularly regarding the above case and six others as follows:—

I make this report of some cases of scarlet fever for the reason that I look upon the result as good proof of the benefits of isolation in the prevention of the spread of the disease. A child two years of age in the family of Mr. H. was taken sick on Dec. 20, 1881. The disease was probably contracted in Detroit, as the child had been visiting there with an aunt about ten days before the attack. There were no other cases in the vicinity nor had there been any in *that house.* I caused a room to be prepared for the use of the child. The disease ran a mild course, terminating in recovery, with no sequela, in seven or eight days. The surroundings of the child were of a first-class character. The history of the six following cases is of more importance, for the reason that the surroundings of the children were bad because of the condition of the house, all the sick being crowded into two small rooms. The important points to which I wish to call your attention is my method of quarantine in these cases. As soon as the disease made its appearance the child was put as far from any other patient as possible, and no person left these premises, as far as I know, until the quarantine was removed, being about six weeks from time of first attack. One child died of albuminuria in the fourth week. There were plenty of children in the vicinity of this family, but not one case has there been outside of this house traceable to these cases. I look upon these cases as good proof that scarlet fever may be prevented. When placed on a footing with small-pox and as rigidly quarantined, we will see scarlet fever reduced to its minimum of prevalence. Both of these houses were disinfected by the burning-sulphur method, excepting articles which were not worth saving, and these were in every case burned.

Dr. S. J. Koon, health officer of Lisbon, Ottawa county, reported, under date of Dec. 26, an outbreak of scarlet fever as follows:—

Yours of Dec. 23, with circulars and documents in reference to scarlet fever, is received. Thank you for the circulars, and be assured I have already distributed them to as good advantage as I could. You also ask for a special report of the outbreak of scarlatina. In a Catholic settlement about four miles from this place, in the township of Wright, Ottawa county, there is a large Catholic church, and adjoining it a school-house. There is a large congregation attends the church, and the scholars in the school are quite numerous. In this settlement scarlatina broke out last May, and there were some fatal cases, but it did not spread very much. The priest and teacher objected to closing the school, and very little was done to check its course. Again in August it broke out with great violence, and several deaths occurred. The school was suspended for a short time, and every precaution was taken, such as isolation and fumigation and disinfection, so far as we attended the cases (i. e., myself and brother, who is my partner). The main violence was in three Catholic families, and this time it lasted about six weeks. It broke out again in the first part of this month in the same neighborhood. We have treated but few of the cases. Some have died. We have done what we could in the line of restriction, etc., but it is impossible to get the people to do as they should. Until Dec. 18 there had been no cases outside the Catholic people. But on the 18th a child of 5 in this village was taken very violently, and died on the 23d. We cannot trace the contagion in this case, though the family board at a hotel and strangers might have been there with the infection. We have taken every possible precaution in the way of isolation and the use of disinfectants, etc., and after death have fumigated thoroughly with sulphur. We are very anxious to do all in our power, and your circulars are very opportune.

Dr. Otis Moor, health officer of Porter, Cass county, on Dec. 29, 1881, reported 6 cases of scarlet fever in his township. On Jan. 6, 1882, he sent a more detailed account of the outbreak, as follows:—

I herewith submit to you a partial report of an outbreak of scarlet fever within my jurisdiction. I was called, Dec. 25, 1881, to the house of Phillip Bullion, to see a child five years old, and found her quite sick with high fever and sore throat. The next morning, Dec. 26, found her worse, with marked eruption. Another child in the same family, aged nine, I found suffering with the same disease. I immediately stopped the school, which was only about sixteen rods from the house, and at which the children had been attending. On Dec. 28 the third case occurred in the same family, an infant, all of whom are now convalescent. Dec. 27 I had reported to me by another physician four more cases, all of children attending the same school. December 31 there were nine cases in this school district, but as yet no deaths. January 2, I was called to see a son of Samuel Markley, living in the district adjoining. He had visited the first named school Dec. 26. He is at present under my care. I have distributed the printed notices sent by your board, and taken other precautionary measures, isolation, etc. It is self-evident that the contagion was brought into the school, but by whom or how I have not yet been able to determine.

Dr. Moor sent on Jan. 31, 1882, additional facts relative to the outbreak, as follows:—

Since my last report scarlet fever is still raging in this township (Porter) although it is mainly confined to one school district. There have been two more deaths, both from sequelæ. The school board of the district reopened their school, but this morning I again closed it with instructions not to reopen without permission from me. I have great difficulty in keeping the adult portions of an afflicted family at home. There are now about fifteen cases reported and under my own care. I have closed the school in the adjoining district. *Could vaccination have anything to do with this disease?* as every case so far has been previously vaccinated, generally from humanized material, scholars in the school vaccinating each other, parents vaccinating children, &c. Has a health officer full power to close a school in an infected district, and *compel* people in infected families to stay at home? Please send me some more circulars on scarlet fever, "No. 46," also some more "No. 47," and oblige.

Dr. Moor reported, on March 27, a second outbreak of scarlet fever in Porter township, as follows:—

I write you under this date of what might be termed a second outbreak of scarlet fever in this township. I was called, February 28, 1882, to see a sick child two and one-half years old. Found a well developed case of scarlet fever. The child had been sick three days before I saw it. In the same household there was a child four years old, four adults and a nursing babe. I immediately quarantined the whole family. March 5 the hired man in this family took to his bed. I saw him the same day, and found a very malignant case of scarlet fever. He was a stout German, and in perfect health prior to this date. None of the rest of the family were or have been sick since. March 11 my own son was taken sick, which soon developed into the same disease. His age six and one-half years. The German boy, named Fred. Schmidtendorff, was nursed by his mother, who unbeknown to me, took his clothes home, a distance of one and one-half miles, to be washed, and on March 15 I was called to see the Schmidtendorff family, and found the mother, father and three children all down with the same trouble. All were very sick, but are now nearly well, but are troubled some with the sequelæ of the disease. My own son is now convalescent. In regard to the source of contagion I will state what I have been able to ascertain. February 2 this first case, with its mother, passed through the infected district mentioned by me in my previous letters to you; passed a house where a child had died during the night of scarlet fever, and where the bedding and bed, sheets, &c., were hung in the yard; rode in a buggy and in the center of the road; stopped nowhere in the infected district; went into a store outside of this district into which, on the same day, two men had been who had just come from burying the child, but who were not present when the child was in the store. This is positively the only known source of contagion. Could the germs of the disease lain dormant from the time the child was exposed, February 2, until the time the child was taken sick, February 25, and could the child have been exposed in the buggy or in the store? If I can ascertain anything more will let you know. There are no new cases at present. We do all in our power to restrict the disease, but the people, and even some of our physicians, are not all fully alive to the contagious nature of the disease, and will expose others in spite of our vigilance.

Dr. C. W. Backus, health officer of Three Rivers, reported an outbreak of scarlet fever Jan. 2, 1882, as follows:—

In regard to my weekly report of scarlet fever in December, we had a few very mild cases in the second ward of our village, and as the physicians of our village promptly report all diseases dangerous to public health, I was informed of the cases, and took measures to restrict its ravages by isolation and disinfection. and up to the present think no new cases have appeared. As to the source of the contagion, I could not determine. In the same ward one and two years ago, during the winter months, scarlet fever made its appearance in several families at about the same time,

but was also mild, no death occurring during those different attacks; and at that time used all precaution to prevent its spreading, and the first case reported this winter in December, was in *one of the families who had it two years ago. One of the children escaping at that time was the one first reported this* siege, but was very mild. The other cases occurred in a family that had not lived in that ward during the previous winters when it existed, but moved from the country into the village about 8 months ago. The people residing in the ward are almost all laboring men, some working on the railroad and some in other towns, but their families residing here, they coming home every Saturday and returning to work Monday. *Quite a number are employed in the paper-mills in this place.* But I have not been able to trace whence it came, though my efforts have prevented it spreading to any extent, and so far it has been very mild. The doctors readily co-operate with the health officer in this village, and we get along nicely without regard to creed or sect.

Dr. H. C. Clapp, health officer of Mendon, reported scarlet fever as follows, under date of January 3, 1882:—

The case of scarlet fever I reported was a mild, isolated case, and as yet none follow. During an endemic of measles last spring one little girl had measles complicated with scarlet fever, who was quite sick and for a long time. This was in May. This little girl, who is now convalescing from scarlet fever, has had free access to that house, being a mate for the girls of the family ever since, although not during her sickness, nor until after complete convalescence. The family took no special pains to disinfect. Can trace this case to no other contagion, which, at least, is problematical. No other cases around. Am enjoining the usual precautions in this case, and think it will not spread.

E. O. Smith, health officer of Orleans township, reported on Jan. 6 a case of scarlet fever contracted in Canada, as follows:

Concerning the cases of scarlet fever in this township I would say there has been but one case, a little girl. She had just come home from school in Canada where probably she was exposed. When she first arrived there were a number in to see her, but she was only taken on the cars, and the case being reported and the patient being isolated it did not spread, or has not as yet.

Dr. Hugh McColl, health officer of Lapeer City, reported a single case of scarlet fever on Jan. 21, 1882, as follows:—

On Dec. 21, 1881, I was called to see a young lady 18 years old, daughter of V. H., four miles south of this place in the town of Lapeer. I found a well developed case of scarlatina. Upon inquiry found that no cases of scarlatina were in the neighborhood, nor had the young lady been away from home. Upon further investigation, however, discovered that a younger brother was taken sick last summer in July, 14 days after attending a picnic. Had a rash all over the body. Was confined to bed three or four days but not sick enough to alarm them so as to send for a physician. His fever subsided, rash disappeared, and boy got well, complete desquamation of the cuticle following. No other cases occurred in the family or in the neighborhood at the time, although no precautions were taken as it was not recognized as scarlatina and was not thought of again till my questions brought the matter out at the time I was called to see the sister. When the young lady was taken, or at least after I saw her, complete isolation was enforced, no one going near her or her room except her mother, who stayed with her, and complete disinfection by the fumes of sulphur was carried out. No other cases have made their appearance in that neighborhood. The young lady is convalescent. The poison must have remained latent from July to December, and then under favorable circumstances developed again.

On May 27 Dr. McColl reported another outbreak, as follows:—

All the cases of scarlet fever in this outbreak were confined to two families, five persons, three in one family and two in another. Source of contagion from a family which had not been previously reported, having had no physician, and being poor and ignorant neither made a report nor knew that it was necessary to make such. There have been no deaths from this outbreak. All cases have been isolated and disinfection has been carried out. No new cases have arisen and all are now convalescing. Accept thanks for documents.

We find considerable difficulty in getting physicians to make reports of cases, and have to watch them closely in order to keep track of the cases here. Three deaths have occurred in my jurisdiction from the sequelæ of scarlatina after they had been around for weeks, uræmia developing and death following, in two cases in 24 hours from the outset, in the others in 56 hours.

Soon after the great forest fires in the Huron peninsula, in this State, in September, 1881, an official letter was sent by the Secretary of the State Board of Health, to the relief committees, urging them to disinfect all second-hand clothing, which was being received in large quantities in response to their calls for aid. The letter gave directions for a ready method of disinfection. The

following letters suggest relief clothing as possibly the means of communicating scarlet fever in two instances, but in no case was the disease traced with certainty to such a source. The first letter is from S. D. Gromney, health officer of Oliver, Huron county, dated March 10, 1882, and is as follows:—

We have had *twelve cases of scarlet fever in this town since the first of January*. The first three were in the family of John Navatske, and they did not report to me until after three other cases appeared, and then I questioned them, and there is no doubt it was scarlet fever. They live back in the woods three miles now. All the cases that have appeared have been in Polish families. They do not understand our laws, and it is hard to make some of them understand anything, but I have done the best I could under the circumstances. When I learned that the family of Anthony Wyrzebski was sick I went over to his place and asked what was the matter. They said the children were sick with colds. I asked if they had the doctor. They said no, they were too poor to pay one for coming so far. I thought it was scarlet fever, or diphtheria, and sent for a physician immediately, and he pronounced it scarlet fever. One was dead when he arrived. The rest, 6 in number, he brought through. Then Rosanke had a physician from Caseville. He was there on Thursday, and I asked him what was the matter. He said the child had a slight touch of diphtheria. He said there was no danger, but Sunday morning the child died, and one of the others was sick. I took the doctor I had employed there. He pronounced it scarlet fever, and they are doing well. I isolated them from the public, and have allowed no one to go to the houses nor to come away from them. I attend to them myself. I have not allowed any of them out yet. I closed the school for two weeks, and as no other cases appeared I allowed it to start. I have distributed the papers sent me, and put notices, and I hope we have it under control.

These, I think, are the first cases of scarlet fever in this town. Anthony Wyrzebski thinks it might have come in the *relief clothing, but I think not*. They boarded in a house in Caseville, where they came down with it, and I do not doubt but that is the true source of the contagion.

Dr. Richard McGurk, health officer of Capac, wrote on February 2, 1882, an account of scarlet fever supposed to have been introduced by an article of clothing:—

In regard to cases of scarlet fever in this vicinity, I would say there have been eight or ten cases in my brother's and my own practice, none of them within the village, and therefore not within my jurisdiction as health officer of village. The families affected live six and eight miles apart, and the sources of contagion are not known. One case is supposed to originate from an article of clothing sent to a member of the family from the burnt district, but this is only conjectured.

Only one case proved fatal in a family where five were affected with the disease. I advised isolation and disinfection as far as possible, but find it difficult to have such things attended to in the country. No new cases have occurred within the last two days.

Dr. M. Northup, health officer of Port Huron, wrote on Feb. 8, 1882, of a case where scarlet fever was probably communicated by the physician in attendance:—

There have been several cases of scarlet fever here. The first occurred in a German family, and could not be traced to contagion. The last case was in the family of H. W. S. I believe it was introduced into this family by the servant girl or the physician. Just 9 days before the child took the disease the doctor was in the house and vaccinated the children. He was in attendance on the German family at that time. A fatal case has occurred in each family. We have done all we could to isolate the cases. The circulars have been freely distributed wherever the cases occurred.

Dr. L. H. Wurtz, health officer of Coldwater, wrote March 11: "A compliance with our State laws, and prompt action on the part of the local board of health would do much toward preventing these diseases, at least such is my belief and experience." Dr. Wurtz afterward reported scarlet fever communicated by clothing, as follows:—

Several weeks ago I reported two cases of scarlet fever, in my weekly reports to you. Both cases were the children of Rev. H. J. C. The source of contagion I can only trace to clothing. Three or four months ago I reported scarlet fever in a family by the name of S. Mrs. S. was doing the washing for the family of Rev. C. at her home at the time. I notified Mr. C. and no more washing was sent to Mrs. S. As both of Mr. C's children were taken sick about the same time, it is possible that some infected article of clothing was brought into use about that time, though several months had elapsed since Mrs. S. did washing for the C. family.

Dr. James Totten, health officer of Pierson, wrote March 22:

The case of scarlet fever which I reported in my weekly report for week ending Feb. 25th, was

R. K., age 5. The child died on the eighth day of the disease. I followed the instructions of the State Board of Health on the prevention and restriction of scarlet fever, and there has not been another case of the disease within my jurisdiction.

Dr. W. H. Smith, health officer of St. Clair, wrote April 17, 1882, regarding the foolhardy and willful exposure of some persons to contagious diseases:—

In answer to your letter inquiring about the scarlet fever in this city, I will say that it is difficult to trace any source of contagion. The disease appeared first in the family of Wm. Hurst and afterwards in the families of Samuel Harkness, and John Sawher. These are the only cases (five in all) which have occurred within the city limits. The families deny having been anywhere where the disease existed or having had intercourse with each other.

In this city, as doubtless in others, there are certain persons who slip in to see contagious diseases, and, if they escape, at a later date boast of what they have done. If such persons should, on the other hand, pay the penalty of their foolhardiness by taking the disease, it is possible that they would feel ashamed of their conduct and deny the exposure. Possibly in this way may be accounted for the failure at times to trace the source of contagion.

Just north of St. Clair outside the city limits and part of the same epidemic, scarlet fever appeared in the family of Isaac Hurst, brother to case No. 1 in the city, and undoubtedly in some way taken from it. The well children from Isaac Hurst's family attended the Yankee street school, and Mr. Barnard's and Bowman's children in that school became infected. The school was dismissed and no other cases occurred. Mr. Barnard lost two children and Wm. Hurst one, the latter a result of sequelæ. These were the only deaths consequent upon the fever.

Within the city we endeavored to secure complete isolation of each case upon its first appearance. A copy of the enclosed blank notice was served upon the head of the family, and the house designated with a scarlet fever label. A copy of the article published by the State Board of Health on restriction and prevention of scarlet fever was left with the family and efforts afterwards made to secure proper disinfection. The superintendent of schools was also enjoined not to allow any pupil from a quarantined house to return to school until he or she had first obtained a written permit from the health officer or secretary of the board of health.

The result of these prophylactic measures, perhaps aided by a change to better weather, is that the disease has been stamped out of existence. At present we have none in the city.

The blank sent by Dr. Smith is as follows:

OFFICE OF BOARD OF HEALTH, ST. CLAIR CITY
St. Clair, Mich...........................188...

Mr.......................................

DEAR SIR:—You are hereby notified that the appearance of scarlet fever, a contagious disease, in your household has, in the opinion of the Board of Health, rendered the quarantining of your family necessary.

Until further notification, all members of your household are prohibited from going upon the treets, or holding intercourse with any outside parties except your attending physician.

The necessities of your family can be provided for by communicating a knowledge of your wants to the physician in attendance.

By order of the Board of Health.

..................................., Secretary.

Dr. W. H. Bills, health officer of Allegan, wrote May 6 concerning the document on the restriction and prevention of scarlet fever: "The circulars you sent will be of great use in educating the people. Wherever scarlet fever is present they will read them."

Mr. Richard Baylis, health officer of Riley township, Clinton county, reported ten cases of scarlet fever present in his township June 4, 1882, and enclosed the following which he had published in the newspapers:

SCARLET FEVER.—Citizens of Riley will please take notice that scarlet fever has broken out in the southeast part of the town; that owing to indiscreet acts of members of families having the disease, and others, the disease is liable to spread over a large part of that part of Riley, and much suffering and expense and perhaps death ensue. The township board of health will do everything in their power to stop the spread of the disease, and they request the aid of all citizens where and in the vicinity the disease makes its appearance to assist them in enforcing the rules that they have caused to be published of any wanton infraction thereof.

The danger to your families is imminent. Prompt action alone can avoid the danger.

RICHARD BAYLIS,
Health Officer.

Riley, May 29, 1882.

Dr. J. M. Swift, health officer of Northville, wrote June 23, 1882, of two mild cases to which he thought the contagium was brought by the father, who was "traveling everywhere upon railroads."

Dr. G. A. Harding, health officer of Sault Ste. Marie, reported July 3, 1882, a case of scarlet fever in a cashier in a store, and he could determine no other source of contagion than the money brought to the young man by immigrants passing the village. The filthy condition of the immigrants and the money was noticed by the young man, who also thought he noticed a bad smell about the money.

Dr. J. Heitmann, health officer of Jamestown township, Ottawa county, reported July 7, 1882, a serious outbreak of scarlet fever, in which there were 15 cases and eight deaths from the disease, it having been introduced by an immigrant from Holland. His report is as follows:—

The object of this is to inform you that this township had quite a sudden visit of a severe and malignant form of scarlet fever. However at the present time it is dying out. It was brought here by immigrants from Holland. The new-comers, arriving sick, received many visitors, and the germs of the disease spread before a physician or anybody was aware. Eight cases out of 15 new cases died. Then isolation was more strictly kept, and only a few more cases turned up. Now all are recovering, no new case for 8 days. Only by closing all schools and churches we could prevent them exposed to stay more at home also. They do mix with society a good deal, notwithstanding strict orders. It is difficult to find witnesses enough for prosecution. The disease is only among the Hollanders, who are very much opposed to the regulations adopted by this board. We propose to have schools and churches closed at least 8 days after recovery of the last case. Are we right? If there is one church or school opened they will come from all parts of the town to meeting, exposed or not.

Will you be kind enough to send to this board pamphlets of the different diseases, to be distributed among the people, who are very ignorant as to their duty, and very obstinate to obey orders for which they know no law.

Dr. Milton Chase, health officer of Otsego, Allegan county, reported on July 8, 1882, a case of scarlet fever contracted in Muskegon, as follows:—

May 2, 1882, Wm. Tubbs, aged 22, was taken down with scarlet fever, which ran a usually severe course and terminated in recovery in about three weeks. He had but recently returned from Muskegon, where he knew he was exposed to scarlet fever. He lived with his father and mother in the country, about three miles from the village and about 80 rods from any traveled road. They readily acquiesced in quarantine restrictions and use of disinfectants. I depend upon the liquor sodæ chlorinatus. No other cases have sprung from this.

Dr. Samuel S. Jessop, health officer of Mackinac, reported on September 24, 1882, a case of scarlet fever in which the source of contagion was suspected to be bedding or clothing, as follows:

Yours of Sept. 21 reached me yesterday, with circulars. In reply I would state that on the morning of Sept. 10, Mary McLaughlin, aged about eight years, was taken ill with what proved to be *scarlatina*, the rash appearing on the night of the same date. The case has presented all the usual features of a rather mild attack of this disease. The source of contagium is doubtful. I suspect it lies in some old bedding or clothing, as scarlatina is said to have invaded the McLaughlin household the winter or spring before last. No other case occurred, this due probably in part to isolation, which was strictly enjoined on the parents also, as far as this particular family is concerned, partly due to the fact that the other members may have already had scarlet fever. Of this, however, I am not certain. I shall keep this family under observation. The little girl, Mary, although now apparently well, will not be permitted to attend school for a week or ten days.

As a result, in part, at least, of the preparation and issue of a document* on

* This State Board has revised its original document on scarlet fever, and has translated it into the German and into the Holland languages, and many thousands of copies have been distributed by the State Board of Health. To further facilitate its more general distribution, the document has been stereotyped in each language, and copies in either language may be obtained gratuitously by persons in Michigan by addressing the Secretary of the State Board of Health at Lansing, or they may be purchased of W. S. George & Co., Lansing, Mich., at the following prices, cash to accompany the order:—

100 copies for	$1.75	400 copies for	$4.25
200 " "	2.50	500 " "	4.75
300 " "	3.50	1,000 " "	8.00

The order should state whether they are wanted in the English, the German, or the Dutch language.

the restriction and prevention of scarlet fever, and of the general and special activities inaugurated and fostered by this State Board of Health, it is gratifying to see a diminishing number of cases of that disease, and of deaths resulting from it; it is encouraging to see the dangerous characters of scarlet fever so well understood, and outbreaks of the disease so well managed, and consequently so frequently suppressed.

The vital statistics of this State show that for the five years just before the State Board of Health was established, the deaths returned as having occurred in Michigan from scarlet fever averaged 589 each year, and since then only 412 each year, an apparent saving of 177 lives, on the average, for each of the seven years, 1874–1880, or a total of one thousand two hundred and thirty-nine lives in seven years. Though more, perhaps, has been accomplished with scarlet fever than with diphtheria, it is believed that in the immediate future, events will show, as a result of the work of this Board, a vast improvement in public opinion regarding diphtheria, and consequently a great saving of human life from loss by that disease. A comparison of the diseases mentioned in this article shows that, during the year under consideration, scarlet fever appears to have caused less sickness and deaths in Michigan than did either small-pox or diphtheria. There are, however, reports from the Eastern States and from abroad which should prompt to still greater efforts to prevent an epidemic in this State in the near future.

SMALL-POX IN MICHIGAN—YEAR ENDING SEPT. 30, 1882.

During the year ending Sept. 30, 1882, there were in Michigan more than one hundred outbreaks of small-pox in about 61 localities. In the outbreaks of which accounts have been received there were reported 589 cases of small-pox and varioloid, and 159 deaths therefrom. This number of cases does not include the number of cases in the large outbreak at Spalding. If there were accurate reports from this locality, the total number of cases would probably be over 600. The above number of deaths is also smaller than the actual number because of deaths not reported, which would probably make the number about 175.

Letters were immediately sent to each of the localities where small-pox was reported present, and the replies received are abstracted for this article. The replies are arranged by counties in alphabetical order, and each outbreak is commented upon. The letters sent from this office stated that copies of the document* issued by this State Board, on the prevention and restriction of small-pox, were sent by the same mail to the local health authorities for distribution, and the local officers were asked to give a history of the outbreak as regards the source of contagion, the number of cases and deaths, the methods for restriction and prevention, and the success in restricting it.

SOURCES OF CONTAGIUM OF SMALL-POX.

The source of the disease was in all the first cases, where it was known, outside the State. In 21 instances it came direct from Chicago. Some of these cases may prove interesting. Two schooners named the Helen Pratt and the Perry Bronson, from Chicago, were loaded with wood by Indians on the west

* This document was printed on pages 289–304 of the Annual Report of the Michigan State Board of Health for 1881, and was reprinted in pamphlet form and in great numbers for gratuitous distribution thoughout the State.

coast of Traverse Bay. Two Indians employed in this work, from Bingham township, Leelanaw Co., contracted the disease and carried it to their Indian village, named Pashawba, where there were 56 cases and 24 deaths. During the prevalence of the disease there an Indian crossed Traverse Bay into Milton township, Antrim Co., carrying the contagium with him. There were 12 cases and 10 deaths in Milton. From Bingham township it was carried into Leelanaw township, where there were three cases. A vessel from Chicago put into Manistee with a case of small-pox on board, but on the advice of the health authorities the captain returned with his vessel to Chicago. A case which originated in Chicago was found on a vessel at St. Joseph. Two cases of small-pox developed in Battle Creek; the disease was contracted in Chicago. In another instance a woman from Battle Creek contracted small-pox in Chicago and had the disease after returning, communicating it to five persons, four of whom died. Small-pox was introduced into Grand Rapids four times from Chicago, once from North Carolina, and once from Iowa. There were 104 cases and 28 deaths in Grand Rapids. A tramp from Grand Rapids had the disease in the jail at Marshall. The disease was also carried from Grand Rapids into Walker township, Kent Co., where there were two cases. A man came from Chicago, went to Breen, Menominee Co., and had small-pox, communicating it to two others; there were two deaths in Breen. There was an outbreak of small-pox in Spalding, adjoining Breen in Menominee county. A man from Monroe visited Chicago, contracted the disease, was sick at home, and communicated it to his son. A man who had been visiting Chicago had small-pox at Pontiac soon after. A woman came from Chicago to a house in Port Huron township, St. Clair county, mildly sick with small-pox. She communicated the disease to a child in the family she was visiting. The child died. A public funeral was prohibited by the board of health, but there was an "Irish wake" held in the night over the body and the neighbors invited. By this means there were nine cases and two deaths in Port Huron township, and seven cases in Kimball township. There were four cases in St. Clair township just south of Kimball which probably owed their origin to this funeral or "wake," although that was not stated. A person who had passed through Chicago two weeks previously, had small-pox in Elkland, Tuscola Co. Two mechanics who had been working in Chicago came to Geneva, Van Buren Co., where their clothing was washed by a woman who contracted small-pox from the clothing. There were six cases and one death in this outbreak. Afterwards a woman who had lost her child in Chicago from small-pox, came to Geneva while sick with it herself, where she communicated it to two others. A child returned to Detroit from Chicago, after a short time had small-pox. Three sailors who, at different times, had been in Chicago about two weeks previous to their illness, had small-pox in Detroit. One case of small-pox in St. Joseph township, Berrien Co., was said to have been contracted in Chicago.

A woman came from Cincinnati to Union City, Branch county, sick with varioloid, but the board of health did not allow it to spread. A traveling commercial salesman came from Cincinnati to his home in Kalamazoo sick with varioloid. It was not recognized by the attending physician, and there were 11 cases and 1 death in Kalamazoo village, and 4 cases in the township, due to this importation. A woman visiting in Kalamazoo contracted small-pox and was sick at Battle Creek. There were two cases of small-pox in Detroit, probably contracted from a man who had recently had varioloid in Cincinnati.

The steamship Cimbria sailed from Hamburg March 29, 1882, arriving in New York on April 12, with a case of small-pox on board. Passengers on the Cimbria came to Michigan. One, Bettit, went to East Saginaw, where he had varioloid, and communicated the disease to others. In that outbreak there were 6 cases and one death. A friend from Saginaw City, who watched with the sick in East Saginaw, had small-pox. Another passenger, Gesa, went to Reed City, where he had varioloid, and gave it to 4 others, one of whom died. Among those who contracted it was a carpenter who went to Westwood, Kalkaska county, where he was taken sick. From him there were 11 cases in Mancelona, Antrim county, 3 cases in Custer, Antrim county, 29 cases and 5 deaths in Rapid River township and Westwood village, Kalkaska county.

A case of small-pox at Albion probably contracted the disease in a sleeping-car. The first case in Plainwell was contracted in a paper-mill. In Manistee the disease appeared in a family who had lost a babe from the disease on the ocean in coming to this country the year before. There were 10 cases and 4 deaths in Manistee. The first case in Stanton contracted it in Pittsburg or Fort Wayne. The disease was thought to be brought to Milford in the person or clothing of a man who had come from Colorado. There were 6 cases in Milford. The disease was introduced by immigrants into Port Huron two times, and into Detroit two times.

ACCOUNTS OF OUTBREAKS OF SMALL-POX IN MICHIGAN DURING THE YEAR ENDING SEPT. 30, 1882, AND EFFORTS OF BOARDS OF HEALTH TO RESTRICT THE DISEASE.

ALLEGAN COUNTY.

Dr. B. Thompson, health officer of Plainwell, reported on April 15, 1882, small-pox contracted while working in a paper-mill, as follows:—

Your favor of the 13th inst. is at hand. The documents have been distributed as directed. One case of small-pox contracted from rags at the paper-mill, the patient having worked there a few weeks before coming down with the disease.

The measures of restriction were isolation, vaccination, and re-vaccination. I cannot tell with what success, as yet. The attending physician, Dr. R., failed to make a correct diagnosis of the case. The patient, Mrs. Charles Randall by name, was taken sick on Wednesday, April 5, at least she gave up work on that day. The eruption appeared Saturday afternoon, April 8, called measles. On Monday afternoon, April 17, I visited the case in order to confirm diagnosis (measles), but found the disease to be small-pox. During the time from April 5 to April 17 inclusive, members of 6 or 8 different families visited the house and patient, some of whom had been vaccinated, and 2 or 3 had not been. Question: What should be done with those who have been exposed during the time mentioned?

The persons exposed should be kept under close surveillance by the board of health until the period of incubation has passed. On April 24, Dr. Thompson reported new cases as follows:—

With regard to the health of this village I again report small-pox or varioloid, contracted from the case last reported. There are three new ones (varioloid). No deaths as yet We enforce isolation; that is, the three new cases were the other occupants of the house where the small-pox originated. Mrs. Charles Randall is the name of the person that came down first—old Mrs. Randall, aged 50, and her two sons, Frank and Alonzo, aged 18 to 20, are the ones that now have varioloid. The cases are all doing very well, and the first one will soon be convalescent. No one of the several reported in my last as having been exposed has shown any symptoms of coming down with the disease. To-day, Monday, April 24th, is the fifteenth day since the last person was exposed. All, except those in the house where the disease started, have been, so far as I can learn without a personal visit, successfully vaccinated. The first case was taken sick, as I wrote you, April 5. The new ones were taken ill all about the same time, on April 19.

ANTRIM COUNTY.

The infection was brought to Milton township, Antrim county, by an Indian from Sutton's Bay,* Leelanaw county. William Thomson, supervisor of the township, reported as follows, Dec. 12, 1881:—

* For an account of small-pox in Leelanaw county, see a following page.

The infection was brought to this township by an Indian from Sutton's Bay, Leelanaw county, Michigan. The number of deaths is 10, and the number of cases is 12. There are no cases at present in the township. A quarantine has been established within the township, 1½ miles from any public highway, where all parties that have been exposed to the disease are now. Communication is made by a bulletin board. A disinfectant has been used quite extensively amongst the Indians; sulphur has been used. I think they have been used with good results. No white persons have been infected by the disease, and the Indians that have been affected are all with dark complexions

Dr. Chas. Beaver, Jr., health officer of Mancelona township, Antrim Co., reported small-pox on Aug. 3, 1882, originating from an outbreak at Westwood, Kalkaska Co., the source of which was traced to Reed City, Osceola Co., where small-pox was introduced by an immigrant who came over on the steamship Cimbria.* Dr. Beaver reported as follows:—

A man came from Reed City, Osceola Co., to Westwood, Kalkaska Co., with what the doctor there called chicken-pox. The eruption was out when he arrived. From him the disease we are now having [small-pox] had its origin. We have had eleven cases. No deaths directly from this disease. We have quarantined against the infected districts, the places where the disease exists are isolated, no communication allowed, and the houses thoroughly disinfected. Since these measures have been taken and the gravity of the disease explained to the people we have had no new cases. I have three cases on hand at present.

BAY COUNTY.

Dr. J. R. Thomas, health officer of Bay City, reported small-pox present on Dec. 31, 1881, as follows:—

We have one case of distinct small-pox which is getting along finely, also a light case of varioloid which will be turned loose Monday. We are wholly in the dark as to where it came from. We expect two more cases in the same family. There were two children there that never were vaccinated and it was impossible to get any vaccine virus till I fear it was too late. We isolated the cases, closed the streets, put on a police day and night, and have strong hopes we may smother it where it is. At first I feared there might be a case hidden, but now I think not. Many are being vaccinated.

On Feb. 4, 1882, Dr. Thomas reported the outbreak as restricted, and no cases present, as follows:—

We feel very jubilant over ridding ourselves of the small-pox. There have been eight cases and no deaths. But I assure you we have been vigilant in order to prevent it spreading, and now are in hopes it will give us a rest.

BERRIEN COUNTY.

Dr. R. F. Stratton, health officer of St. Joseph village, reported on Nov. 23, 1881, a case of small-pox in St. Joseph township, contracted in Chicago, and wrote that the usual precautions were taken. On Feb. 2, 1882, Dr. Stratton reported a case of small-pox on a vessel in St. Joseph river, the supposed source being Chicago.

BRANCH COUNTY.

Dr. R. P. Beebe, Dec. 29, 1881, wrote the following letter reporting a case of varioloid at Union City, imported from Cincinnati:—

A case of varioloid was imported from Cincinnati. It seems that the father and mother of the patient were notified by letter that she was coming home and had been exposed to small-pox, advising them to be vaccinated. The health officer of Union City vaccinated them. She arrived last Friday night, was taken sick Saturday. Her father was at church Sunday. A little girl went to the house after milk, and neighbors kept calling at the house until the middle of Monday forenoon, when some of them found out what was the matter and reported, which caused so much excitement that something had to be done. The object was to keep it secret, and they probably would have succeeded if the patient had not told one of her friends, but her friend did not care to stay, and spread the news, which caused quite a panic.

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* For an account of the outbreak at Westwood see Kalkaska county, and at Reed City, see Osceola county. An account of the introduction of small-pox by immigrants from the same steamship, Cimbria, which may be allied to this outbreak at Reed City, is given under the head of Saginaw County.

Dr. H. F. Ewers, health officer of Union City, reported on Jan. 3, 1882, the following concerning the action of the board of health:—

Board of Health Proceedings.

COMMON COUNCIL ROOMS, BOARD OF HEALTH,
Union City, December 26, 1881.

Present—Dr. H. F. Ewers, health officer. Trustees F. C. Rheubottom, M. F. Buell and C. Padgham.

Trustee Buell offered the following resolution, which was passed:—

WHEREAS, A case of varioloid is now in the village of Union City, in the house on the south-west corner of Hammond and John streets, therefore—

Resolved, That the persons now occupying the house used by E. M. Carpenter, as a residence, on the corner of Hammond and John streets, be placed in quarantine, and that the said E. M. Carpenter, Mrs. E. M. Carpenter, Mrs. J. B. Leonard, and Annie Carpenter are hereby prohibited from appearing upon any street in the village of Union City, or upon any premises outside of the lot on the corner of said Hammond and John streets.

Resolved further, That all citizens of the village of Union City, or persons visiting said village, are hereby forbidden to enter said premises except under the direction of the health officer.

The following resolution was passed:—

Resolved, That in view of the extraordinary danger to the public health from small-pox, the health officer be, and he hereby is, directed to see to it that every person residing in Union City is properly vaccinated, and that to successfully accomplish this end vaccination be made free to the patients, and that all expenses be borne as a public burden.

He also wrote:—

Vaccination is being done rapidly and effectually. No new case reported. The patient is convalescing and we trust no case will result from it.

Dr. Le Roy Dibble, health officer of Sheridan township, reported a case of small-pox in Albion village on Nov. 21, as follows:—

Mr. Shears, returning from Fargo with his family, came to Mrs. Joslin's boarding house. About nine days after his arrival, the boy, about nine years of age, was taken ill with chills, pains in loins, with high fever. Four days after chill the eruption appeared. Supposed he took it in a sleeping-car. The case is located on College Hill, village of Albion. I informed the health board and did all I could to prevent its spread. They have quarantined the house and inmates. I think if they do what is proper they will be able to confine it to its present location.

On Nov. 30, Dr. Dibble wrote as follows concerning the source of contagion:—

Mr. Shears had been a month in Fargo. Before he came here he had been in Chicago with his family three days, but the boy had the premonitory symptoms on his arrival here, which would rather clear Chicago as the place of infection. Taking the time they started from Fargo, including the three days in Chicago, would make just eleven days to the time he had his chill. This would almost clear Chicago as the place of infection. My experience leads me to conclude that sleeping-cars are a prolific source of infection, not only in small-pox, but in other contagious diseases. Only three weeks ago a brakeman on one of the passenger trains on the Michigan Central Railroad was taken ill on his trip to Chicago. He was put in a sleeper and returned to Detroit. He was then put in hospital. Two days after it was ascertained that he had small-pox. Another prolific source of contagion is woolen blankets and furs that are brought here from the old country. While I was assistant at quarantine in New York we inspected and fumigated these thoroughly, and I am convinced that the great number of cases in the northwest and in our large cities is due to contagion from this source, from the large influx of foreigners in the last year. Only a very small proportion of the foreigners of the Scandinavian States have been vaccinated. There should be a law that they should be vaccinated at the port of entry.

The village of Albion was without a health officer at the time of the introduction of this case. Dr. W. W. Collins was soon appointed, however, and the disease was confined to the one case.

Dr. S. S. French, health officer of Battle Creek, sent the following report of small-pox, which he made to the board of health of the city on March 27, 1882:—

To the Board of Health of the City of Battle Creek:—

On Friday, March 10, Dr. Cox reported to me a case which he feared was small-pox. I visited with him the patient, a Mr. George Boswell, living at No. 13 Rittenhouse avenue. Agreeing with the doctor in his diagnosis of the case, I called a meeting of the sanitary committee. Upon hear-

ing the doctor's report the committee directed me (should the case prove small-pox as we expected), to remove the patient to the place prepared for such cases, and to see that he was well cared for.

The next day, the marshal having everything suitably arranged at the hospital, and Mr. George Busk being engaged as nurse, the man was removed.

He was cared for by Mr. Busk, under the professional direction of Dr. Cox, who continued his attendance upon the case until Saturday, the 18th inst., when the man died. His death was reported to me in the evening. I directed the marshal to make all necessary preparations for the burial; he did so, and the body was interred just after midnight the same night.

As Mr. Boswell left a wife and other friends in the city, it was thought too bad to bury him in the potter's field. Upon the advice of many citizens I directed the purchase of a half lot in the cemetery on which to bury him, the widow to have the title if she desired it upon paying the price paid for it.

Learning that the wife had surreptitiously visited her husband at the hospital, and that she had never had the disease, I directed her to stay in her own home in quarantine until the time should pass in which the disease might develop itself in her from such exposure. That time has now expired, and I am glad to be able to say that no one has taken the disease, and that all danger from this case is now passed. S. S. FRENCH, Health Officer.

On April 4, Dr. French reported two cases of small-pox contracted in Chicago.

In May, Dr. French reported another outbreak in which the first case contracted it in Chicago, and on her return five members of her family contracted the disease from her. The following is the report on these cases made by Dr. French to the common council of the city:—

To the Honorable Mayor and Common Council of the City of Battle Creek.

On the 23d of May my attention was called, by the attending physician, to some cases of illness at No. 76 Kalamazoo street. On examination I found in one house five cases of small-pox, viz: Mr. N. E. Townsend, Mr. Harvey Halladay, his wife and infant child, also a daughter of Mr. Townsend nine years of age. The first four named were in the suppurative stage of the confluent variety of small-pox. The little girl was not so far advanced with the discrete variety.

Investigation showed that Mrs. Townsend recently visited Chicago, and about two weeks before my attention was called, had varioloid, or small-pox in its modified form (in the house where these cases occurred), thus giving a direct source of contagion for all the latter cases.

I immediately took measures to prevent the further spread of disease among them, perfect isolation of the patients, disinfection, etc. I caused all persons residing in the vicinity to be vaccinated without regard to former vaccination.

Those persons who had been most directly exposed were placed in quarantine. I visited that portion of the city every day to see that these measures were thoroughly carried out, the physician who reported the cases meanwhile continuing his attendance.

Mr. Townsend, Mr. Halladay, his wife and child, died within a little more than a week from the time my attention was called to the cases. The little girl has recovered.

The time for incubation is now passed, so there is no danger of more cases arising from this source. The common council, sanitary committee, the police and neighbors, gave their assistance in carrying out these measures of precaution. Those placed in quarantine remained as directed, thus materially contributing to their success.

The case of this family illustrates in a striking manner the effectiveness of vaccination; none of these persons had ever been vaccinated. Living in the same family was a daughter of twelve years of age, who had the same exposure as the others, and in addition has remained in the house during all this sickness, with the sick and dead; she has entirely escaped the disease, having been successfully vaccinated last March. I have been called daily to examine a greater or less number of cases of eruptions and find measles and chicken-pox prevailing in differents parts of the city.

S. S. FRENCH, Health Officer.

On June 21, Dr. French reported a case of modified small-pox in a woman who had just been visiting in Kalamazoo.*

Dr. J. F. Smiley, health officer of Marshall, reported, on Jan. 21, 1882, small-pox in a tramp, as follows:—

A tramp was confined in jail. I was called by jail doctor to see him Wednesday, and diagnosed varioloid, and took immediate steps to protect the public. Called the board of health; confiscated a house in an isolated locality, and as soon as necessary arrangements could be made we removed him; hired a man who has had small-pox to take care of him; also secured the services of a physician. The house is placarded. The jail has been thoroughly renovated, and in all probability the thing can be kept where it is. The tramp came from Grand Rapids.

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* For an account of small-pox in Kalamazoo, see Kalamazoo county.

CASS COUNTY.

Dr. Reuben Schurtz, health officer of Newburg township, Cass Co., reported small-pox in the townships of Marcellus and Penn, adjoining Newburg, in the following letter, received Feb. 8, 1882. No reports of the disease were received from the health officers of the townships of Marcellus and Penn. A letter was received from the health officer of Marcellus village, which follows the letter from Dr. Schurtz:—

Although my report is that no disease dangerous to health now exists in the township to my knowledge, yet the existence of small-pox in townships immediately joining us, that is existing now in Vandalia (Penn township) and Marcellus, seems to place us in a hazardous condition. Will you be so kind as to forward us instructions in regard to small-pox, as I have reasons to apprehend that we are in danger of an outbreak. Our board have met and forbidden all public meetings, church services included, except schools, and will have another meeting Tuesday.

Dr. E. C. Davis, health officer, reported small-pox in Marcellus village Feb. 2, 1882, as follows, which also treats of what was called "abortive varioloid:"—

The two cases reported to you some time ago by me, that of a young lady, developed into a severe case of concrete small-pox, and the patient at present is considered out of danger. The scabs are mostly off. Her father, Mr. Paulin, had the varioloid, has been up for several days. Thus far the disease has progressed no farther outside, but Monday evening a case was reported by one physician and concurred in by another. Tuesday morning I saw the case and pronounced it a case of vaccination fever. The physician who attended the case agreed with me before a meeting of our village board, but the physician who was called as counsel first declined to go the second day, and now calls it "abortive varioloid." Says the man would have had small-pox if the vaccination at the time working had not aborted it.

Symptoms:—The man was vaccinated about 9 or 12 days ago, never exposed to small-pox, had fever for two or three days with the usual symptoms of vaccination, spot where vaccinated larger than a quarter-dollar, arm and portion of side swelled and very red and inflamed. On Monday evening there was some appearances of a rash in,—not raised—the skin. No roughness nor shot-like feeling disappearing on pressure or stretching the skin. The doctor told him, "You will be covered Tuesday with small-pox eruption and be very sick." But Tuesday morning before 8 A. M., when I called, the arm felt easier. Rash had disappeared. The man was up and dressed, tongue and pulse normal, and to-day says he is all right, knows he had no small-pox. The other physicians say it was abortive varioloid and not dangerous. I do not understand that there are any such cases at ordinary vaccinations. If there were it would be dangerous. Their saying it was not dangerous is a practical admission that I am right. There are (so reported to board), other cases in the township.

EMMET COUNTY.

Benton Bement, clerk of the board of health of Harbor Springs, Emmet Co., wrote on Dec. 29, 1881, the success attending their efforts at restriction as follows:—

The board of health has maintained the most stringent measures since the small-pox developed itself here Nov. 16, and with what success you can judge when I tell you that the small-pox did not spread beyond the single case which first developed. The Indians are so peculiar in their habits that people rarely ever know of a case of sickness of any kind among them unless death ensues, consequently it is a hard matter to keep an accurate record of diseases among them. They are so filthy in their habits that any disease dangerous to the public health is almost certain to be fatal with them. The village president, C. D. Hampton, acted as health officer (volunteer), until his appointment as such by the board. He is a very thorough officer and I will guarantee that no village in the State is more prompt and rigid in enforcing sanitary measures than this. At present there are no cases of diphtheria or small-pox in the village, and I hope I shall not have to record another.

GENESEE COUNTY.

Dr. A. A. Thompson, health officer of Flint, reported a case of small-pox in Flint May 15, 1882, as follows:—

On April 5 a man from the north lumber country, by the name of Geo. Williams, arrived in Flint by the F. & P. M. R. R. on the 6 P. M. train, and after going all about town and buying himself a suit of clothes, went over to a hospital to visit a sick friend. About 11 or 12 o'clock that night it was discovered that he, the said Williams, had the small-pox. Before daylight next morning we

had him in a pest-house. It proved to be of the confluent variety. There has been only one other case from this exposure and that was the adopted son of the proprietor of the hospital. This last case has been in the pest-house three weeks lacking a day, and we think we shall have no further spread of the disease except it may come from some new importation.

On July 3 a dispatch was received from the health officer of Flint, asking the Secretary of this Board to go to Flint to confirm the diagnosis of small-pox. It was impossible for him to do so, and July 6 the following letter was received from Hon. LeRoy Parker, President of this Board:—

Your dispatch just received. The necessity for any one's coming here is past. Drs. Lyster and Mulheron, of Detroit, came up Monday and visited 6 or 8 patients, and unqualifiedly pronounce them to be suffering from small-pox. So we have it bad. Five of the cases are virulent. Two of the others have recovered. Dr. Thompson, the health officer, is doing what he can now to quarantine the patients and prevent the further spread of the disease. The common council are alarmed and will go to work. I wish you would send a good supply of the small-pox documents to me or to Dr. Thompson, if he has not already got some of them. One or two more cases have appeared since Dr. Lyster was here.

The first case in this outbreak was a woman aged about 55, who, when afterwards interrogated, could trace her exposure to no other source than a peddler, supposed to have come from Canada, who had called at her house. Ten days after the woman was taken sick the daughter came down with the disease, which was not yet ascertained to be a contagious disease. In several days more, a boy, exposed by the daughter, was taken sick. This case was diagnosed as chicken-pox. The health officer diagnosed the case as small-pox, but met with violent opposition when he attempted to quarantine the family. Other cases appeared, called by some chicken-pox, and by others small-pox. Finally two physicians from Detroit said the cases were small-pox, and the health officer was then justified in his first action, and enabled to proceed to restrict the disease. There were forty-six cases and six deaths. At the meeting of this Board in July, 1882, Mr. Parker and Dr. Lyster made reports of this outbreak. They were requested to complete their reports after the close of the outbreak, and present them for publication in the Annual Report of this Board, incorporating a report on the subject, made to this Board July 10, 1882, by Dr. John J. Mulheron.

Since the foregoing was in type the report by Dr. Lyster, including a letter from Dr. Thompson, health officer of Flint, and the report by Dr. Mulheron, inspector for the National Board of Health, has been received, and is here inserted as follows:—

The Small-pox Outbreak at Flint, Mich., June, 1882,—Report by Henry F. Lyster, A. M., M. D., Detroit.

The history of this outbreak is not peculiar, but serves to illustrate the method by which contagious diseases obtain a foothold in a community. An outbreak in every way similar occurred during the month of July in Portland, Mich., and obtained a prevalence which it would not have done had the disease been one familiar to the people and the medical practitioners in that region. The recent epidemic of yellow fever at Brownsville, Texas, which has attacked over two thousand persons, with a loss of more than two hundred lives, was mistaken for local malarial disease, and several hundred persons were compelled to endure the epidemic, who, had they been rightly informed of its nature would have moved away from its track.

The primary error lies in the fact that the large majority of the practitioners of medicine never see a case of small-pox or varioloid until it is forced upon them in their practice. No wonder that they do not recognize readily what they never before have seen.

The second error is on account of a decided tendency to adhere to an expressed opinion. The nature of the profession will not admit of vacillation on the part of its followers, and the confidence which has been so tardily bestowed will not survive the sudden change of diagnosis in critical cases, except to a very limited extent. The physicians have usually learned this in their early days of practice by the expensive lessons of experience, and no one is more apt to be tenacious of his opinion than the experienced physician.

To my mind the first step to be taken to meet the outbreak of these local epidemics of contagious diseases is to require the profession to become familiar with them by personal observation before entering upon the responsibilities of the practice.

FLINT, MICH., *Oct. 23, 1882.*

Henry F. Lyster, M. D., Member State Board of Health, Detroit, Mich.:

MY DEAR DOCTOR.—For the first time since your letter arrived I have just a moment in which to reply to your inquiries about the way in which the small-pox was fastened upon this community.

An establishment may be found here which is called a hospital or a medical institute, whatever that may be. The proprietor keeps an agent in the north woods selling tickets, at five dollars each, to choppers and hired men generally, which entitle them to board, lodging, and treatment provided any or all of them are taken sick within a specified time, and the proprietor boasts that he sold fifteen hundred of these tickets last fall and winter. On the 5th day of April last there arrived one of these ticket-of-leave men at this so-called hospital, sick, indeed very sick. After a few hours it was found that said ticket-holder had small-pox. It was then revealed to him that this "what is it" called a hospital did not take in contagious diseases, or if it did it ejected them with great suddenness as soon as found out. So Mr. George Williams from the north woods, with his hospital ticket in his pocket, was set out in the streets and the health officer notified that Providence had sent us a case of small-pox. This city does not own such a thing as a pest-house, but until one was improvised with all its paraphernalia, including a nurse, the activity of our health officer and sanitary committee was something worth seeing. In about two weeks after Mr. Williams arrived it was found that one of the attendants of the hospital who had been sick several days was breaking out pretty freely, and that he really had small pox, and he was sent to keep Mr. Williams company. In a few days another one of the nurses in this establishment came down with the disease and he was hustled off by the proprietor to his home in a distant part of the county, where he and several members of his family had genuine small-pox. About a month after our ticket-holder from the north woods came to us, a case of "chicken-pox" in an old lady by the name of Waters was reported to the health officer, who did not coincide with the diagnosis of the reporting physician, but considered the case one of *impetigo sparsa*, and so announced it. In ten days afterwards the daughter of Mrs. Waters, a young lady of 22 or 24 years of age, was taken sick of an eruptive disease somewhat like that of her mother, only the eruption was much more abundant and somewhat different in character, but by the family physician considered still chicken-pox, and so not reported to the health officer at all. It is now certain that Mrs. Waters' disease was a mild case of varioloid, very much modified by having previously had kine-pox, and that the daughter's malady was genuine small-pox in a mild form, she having contracted it from her mother, but how the mother was exposed is still a matter of great uncertainty. About the 1st of June, 1882, the little son of Newton Gay, Harry by name, six or seven years of age, grandson of Mrs. Waters, and living in the same neighborhood, was taken very sick and supposed to be suffering from bilious fever. The health officer was called to attend him professionally, not, however, because of the remotest suspicion that the child had any contagious disease. On the third day of his sickness his physician advised the parents of some serious obscure malady impending, as the child was very sick and having a temperature of 104½°. During that night and the next day an eruption appeared, first on the face and wrists and fauces, when the family were warned that it was probably small-pox. The best counsel in the city was had at once and the case was pronounced unhesitatingly one of small-pox. Immediately supervening on this state of things the health officer was informed that his professional services would not be needed any longer, as six other physicians, including the proprietor of the establishment previously referred to, decided it to be only a case of chicken-pox pure and simple. The quarantine was accordingly broken, these six physicians, or most of them, going on to the streets to manufacture public sentiment in favor of chicken-pox and against what they termed the outrageous and oppressive measures attempted to be inflicted upon a worthy family and community by an ignorant health officer and "his friends." The excitement ran so high that the city council were divided in their opinions and although a quarantine was attempted at three different times it was found impossible to maintain it. Fortunately Mr. and Mrs. Gay were vaccinated by the health officer before his discharge and when it commenced to work on the father he began to have a papular eruption which soon became vesicular and passed

rapidly on to the pustular stage, there being perhaps fifty to one hundred pustules. This by the health officer was pronounced to be a very mild case of varioloid, modified not only by the vaccination of years ago, but by the one just working, and modified to that extent that outside of its surrounding and known exposure might well be mistaken by an *expert* in the diagnosis of contagious diseases. Now these chicken-pox doctors took this man out of quarantine at night, put him on a passenger train, one of them accompanying him, and conveyed him to a distant city and back, that they might get a decision in favor of chicken-pox, and they got it by deception in reference to previous exposure and surroundings, the case being modified to the extent above described. However, one of the same parties, upon visiting this city soon afterwards to satisfy himself, decided véry positively that Mr. Gay had genuine varioloid. At the time of his visit the contagion had spread into five other families, all being treated by the "chicken-pox" clique, and called chicken-pox. The visiting physicians unhesitatingly pronounced all these cases genuine *small-pox*, and then and not till then were we able to institute effective quarantine measures and stamp out the disease. Before this, however, one of the city fathers with his whole family, six in all, came down with the disease, all of whom recovered except one. Resulting from the exposure by the Gay family we had thirty-five cases in the city, with three deaths, and eleven cases in the country, with three deaths, six deaths in all.

I thought perhaps this simple statement of how we in Flint got the small-pox and how it spread and made its ravages among us, might possibly interest you, and as you are a member of the State Board of Health, may become of interest to others. The question might arise in the minds of some, "Who is responsible for these forty-six cases of small-pox and these six deaths?"

I am, sir, your obedient servant,

ALMON A. THOMPSON,
Health Officer, City of Flint.

DETROIT, MICH., *July 10, 1882.*

Dr. Henry B. Baker, Secretary Michigan State Board of Health, Lansing, Michigan:

DEAR SIR:—I beg to submit the following report of a recent visit to the city of Flint, Michigan, premising such report with the remark, that although such visit did not come strictly within the sphere of my duties, as Sanitary Inspector of the National Board of Health, it nevertheless grew out of my position as such Inspector.

On Monday, July 3d, I was requested by Dr. Henry F. Lyster, of the State Board of Health, to accompany him to the city of Flint, whence he had been requested to repair by Dr. A. A. Thompson, the local health officer, who desired him to diagnose certain cases of what he (Dr. T.) had pronounced to be small-pox, but which attending physicians maintained were cases of chicken-pox.

On arriving at Flint we were met by Drs. Thompson, Murray, and Cogshall, who accompanied us on our visit to the several cases, and gave the following history on the way:—

The cases were all clearly traceable to that of a boy, Harry Gay, son of Newton Gay, a resident of Flint. Dr. Thompson had pronounced the eruptive fever, with which this boy had been attacked, to be small-pox, unmodified by vaccination, and had ordered the house in which he was confined to be placarded and quarantined, as provided by law. The attending physician, however, disputed this diagnosis, and maintained the case to be chicken-pox. The neighbors, very generally, accepted the diagnosis of the attending physician, and the state of local feeling was such as to negative the instructions of the health officer. The placards were removed from the house during the night by unknown persons as often as they were posted, and all attempts at isolation were futile, certain of the neighbors, it is said, even insisting that their children should visit the house, and in this manner show the confidence of their parents in the diagnosis of the attending physician.

In the usual time, dating from the exposure, five cases of eruptive disease, pronounced by Dr. Thompson to be small-pox, were developed. The physician who had attended Harry Gay was called to attend at least two of these new cases, and strenuously maintained that they too were cases of chicken-pox. In two of the remaining cases the medical attendant, while declining to give a positive diagnosis, inclined to the opinion that they were chicken-pox. The physician in attendance on the fifth case gave chicken-pox as his positive diagnosis. Public opinion ran high, and the opposition to the health officer was so strong as to render ineffectual any efforts which he might make at restriction of the disease; and it was with a view to secure the support of an outside physician, for the purpose of strengthening his hands under the critical situation, that Dr. Thompson requested Dr. Lyster's presence.

On visiting the cases in dispute we found them to be cases of confluent small-pox, clearly defined as to symptoms, and leaving not a shadow of a doubt as to their nature. Our opinion removed from the mind of one of the physicians in attendance all doubt as to the nature of the case, but failed to convince the two others that the cases were other than chicken-pox.

Great credit is due Dr. Thompson for his faithful persistence in his opinions in face of the popular clamor, backed by a considerable professional opinion, with which they were met. His position was a peculiarly trying one, and he acquitted himself with credit.

I shall not attempt to report the somewhat indefinite rumors bearing on the causation of the.

disease in the case of Harry Gay. These will, doubtless, be thoroughly sifted by Dr. Thompson, and the more immediate origin of the present endemic of small-pox at Flint fixed, in so far as facts connected with the cases are attainable. Permit me to regard any duty which may have devolved on me in the premises as having been fully discharged on my making a diagnosis of the cases in dispute. Respectfully submitted,

J. J. MULHERON,
Sanitary Inspector National Board of Health.

[Dr. Lyster's remarks here continue as follows:—]

The small-pox poison in Mr. Gay's system was so nearly neutralized by Mr. Gay's second vaccination that he very nearly escaped experiencing any of its effects. He had no appreciable fever, or headache, or discomfort, of any kind, and the eruption aborted early, appearing in a very few vesicles, which never matured in any way; none pustulated; none were of the unusual size, and none were umbilicated, *i. e.*, depressed in the centre. Taken by itself the eruption could not be determined by any one as a case of small-pox. It is true that chicken-pox rarely affects the adult. I do not remember ever to have seen a case in a person over fifteen or sixteen years of age. And this fact should lead physicians to be guarded in a similar case. The large vaccine crust on the arm was so typical of a successful vaccination that my belief in his case was that he had been thoroughly protected against small-pox, and that it must consequently be a mild case of chicken-pox. I was not aware, at the time, how successfully his vaccination had battled in his system for the mastery, and while it had not fully vanquished the foe, it had rendered it incapable of mischief to the individual, and had aborted its peculiar and distinctive eruption upon the skin.

I do not believe that there is a physician in Flint who criticises the opinion of Dr. Stewart and myself, founded, as it was, upon the appearance of Mr. Gay.

Ten days afterwards (July 3), I went to Flint in the interests of the public health of the State, and, with the other members of the visiting committee, determined instantly upon inspection of the suspected cases. We did not really consult about them at all. It was too evident upon inspection to admit of any doubt, the moment the eyes rested upon the patients.

After examining the Gay boy, and seeing the scars and discolorations remaining from the attack which he had experienced several weeks previously, I became convinced that his father must have, in all probability, suffered from very mild attack of varioloid.

There was nothing in Mr. Gay's appearance or history which led to this change of opinion. He appeared about the same as when I saw him ten days previously, with a lessened trace of his disease still visible, but it was the logic of events which determined it.

Small-pox is not difficult to distinguish to those who have seen it, particularly after the eruption has appeared for two or three days, and it is only when it has been so modified by vaccination that a few doubtful vesicles appear that it can possibly be mistaken.

The history of the invasion of the small-pox at Flint is nothing new. It conforms to that usually observed in the towns and villages of the country. A case occurs, various opinions are expressed. Physicians are of equal weight in the community, whether they decide from experience or from opinion. Factions are formed, the barricaders and the anti-barricaders marshal their cohorts. Canes and brooms are brandished against hay-forks and dust-pans. The doctors hurl diagnostic javelins, poisoned with a venom almost as virulent as the disease itself, which, if they hit their mark, would scarcely leave enough of

the profession alive to vaccinate the town; but, alas, they glance upon the pachydermatous covering of the clan. The editors of the several papers enter into the war with gloves, at first, which they soon remove when they feel confident that the public expects somebody, no matter who it is, to be hit. They know that they can not argue on medicine with the doctors, and that hampers them uncomfortably for a time, until, in the heat of the affray, they forget such little inconsistencies, and fence and thrust with the expertness of a militia colonel at a grand muster. Gradually the ammunition is expended, and the battle dies out with desultory picket firing in the distance; the health officer, as provost marshal, goes his rounds, and the inevitable is accepted. It would be very gratifying if this condition of affairs was changed in this State, and the local authorities were obeyed, and the health officer sustained at the beginning, and the cases quarantined at the outset, and many valuable lives saved, and features spared their life-long disfigurement. Let us all hope for this much-to-be-desired millenium; and to facilitate this let each one, whenever opportunity again offers, favor the safer methods of quarantine.

HENRY F. LYSTER,

Detroit, August 1, 1882. *Member State Board of Health.*

The outbreak of small-pox at Flint.—Report by Hon. LeRoy Parker,, of Flint, President of the State Board of Health.

There occurred in the early summer of 1882 an outbreak of small-pox at the city of Flint and in the neighboring country, of considerable magnitude. The rise and progress of the disease was marked by some peculiar features and affords an interesting study, not only to the medical profession, but also to those who have to do with the enforcement of public health laws.

A brief statement of the beginning and subsequent spread of the disease and the causes which worked to prevent its suppression at its inception is as follows: The first case to which attention was called was that of a Mrs. Waters, quite an elderly woman. A physician was called to see her on the 3d of May and found her with an eruption on her face and body and in her mouth and throat. She had had chills and fever for 24 hours previous. She was not particularly unwell and in a short time recovered. The attending physician diagnosed the case as chicken-pox and treated it accordingly. It seems, however, that he had some doubt in his own mind, for he called in another physician who was the health officer of the city. The health officer thought it neither chicken-pox nor small-pox, but called it *impetigo sparsa.* No notice that the disease was of a dangerous character was given by the physician or family and nothing was done to isolate the patient or to warn people from the house. It is impossible now to tell how or when Mrs. Waters was exposed or how she contracted the disease. Three weeks later a daughter of Mrs. Waters was similarly affected and was seen by the same physician who had attended the mother, on the fourth day after she was taken. He pronounced her case to be chicken-pox also. The health officer was not called to see this second case and no notification was given him of the existence of such a case. This case also recovered.

Shortly after this, about June 1st, Harry Gay, a little nephew of the young lady, who had visited her freely during her sickness and had been held by her in her lap, was taken sick with a similar eruptive disease. Dr. A. A. Thompson, the health officer of the city, was called to attend the case of the boy,

and after an examination he pronounced the disease to be small-pox. He then proceeded as health officer to order the house placarded and quarantined. Unfortunately for the city of Flint his advice was not heeded by the parents of the sick boy. Dr. Thompson was dismissed and another physician called in,—the same one who had treated Mrs. Waters and her daughter. He pronounced the case to be chicken-pox and advised the family and friends not to observe the quarantine and to remove the small-pox sign. The sign was removed by some persons unknown three several times, and as often replaced by the health officer. Much feeling was created by these proceedings, and the family and friends of Mr. Gay were very pronounced in their opposition to the health officer. Very many in the vicinity would not believe it was small-pox and visited the family freely. The father of the boy was broken out and the health officer warned him to keep secluded, but as his own physician advised him that he had nothing more than chicken-pox, he went about freely and attended his store as usual. In less than two weeks five other cases developed among those who had come in contact with Mr. Gay and his boy. These were all pronounced by the health officer to be small-pox cases, but the physicians attending them were equally certain that it was only chicken-pox. The cases were not at first reported. The consequence was that many persons were exposed. Public feeling was greatly excited and was curiously divided. More than two-thirds of the people believed the cases to be chicken-pox and scouted the idea of its being small-pox. Much feeling was created against the health officer on account of his action in the matter. This feeling of opposition was strengthened for a time by an opinion given by Dr. Lyster and Dr. Morse Stewart, of Detroit, to whom Mr. Gay had presented himself in the latter stage of his eruption for inspection. These gentlemen gave it as their opinion from such examination as they had made that Mr. Gay had had chicken-pox. A full account of the aspect of the cases from a medical standpoint, and particularly that of Mr. Gay's, has been prepared by Dr. Lyster in connection with this outline. There was, however, much dissatisfaction on the part of some of the leading physicians of the city and many citizens, with the situation of affairs. They were convinced that small-pox had gained a foothold in the city and was rapidly spreading. Drs. Lyster and Mulheron of Detroit were asked to come and make an examination of the different cases. They did so and as a result of their examination they unqualifiedly decided that it was small-pox in a virulent form. The public was then thoroughly alarmed and active measures were taken by the health officer and the common council acting as the board of health, to check the further spread of the disease. The infected houses were quarantined, barricades were erected, watchmen were appointed, physicians and nurses were detailed to care for the sick, but the preventive measures had been too long delayed. New cases were reported every day and the disease seemed to have spread beyond the control of the health authorities. The citizens were thoroughly aroused and vaccination was very generally performed. The churches were closed for two Sundays to avoid the congregating of people together. Cases of the disease began to occur in the country adjacent to Flint, all of which were traceable to the same starting point. Every effort was made, both in the city and the country, to check the disease, and no expense was spared. The result of this work was soon apparent in the gradual diminution of the cases and in its final extinction. But at what a cost! The total number of cases in the city and country was forty-four. Six of the cases proved fatal. The expense to the

county for medical attendance, supplies, and care of the sick unable to pay for themselves, was over three thousand dollars. The expense to those able to pay their own bills was probably one thousand dollars. There was destroyed by the health officer, of infected furniture, clothing, and bedding, an amount valued at one thousand dollars.

This great cost of money and health and life in the city of Flint and vicinity was directly chargeable to a blameworthy disregard of the public health laws of the State. After making the utmost possible excuse for the failure of the attending physicians to correctly diagnose the early cases under their care, which led them to mistake small-pox for chicken-pox, there exists no possible excuse for their refusal to be governed by the regulations of the health officer, and the destruction of the placards put up by him. The plainest dictates of prudence and common-sense should have led the physician in charge of the suspected cases to yield his own opinion to that of the legally constituted health officer, and not insist upon his own private views at the risk of jeopardizing the public safety. There was a well-founded doubt as to the character of the disease. The physicians and friends who thought it chicken-pox should have given the public the benefit of the doubt, and should have allowed the health officer to take such precautionary measures as in his judgment he thought best. This rule, which has been approved by our State Board of Health, should always be observed. Where there exists doubt as to whether a disease is dangerous to the public health it should be treated as a dangerous disease and the usual precautions against its spreading should be taken. Any other course would be full of possible danger to the people of the State. The old rule of "an ounce of prevention" is applicable to such cases as this outbreak of small-pox at Flint. No physician should assume the responsibility of nullifying the action of the health officer no matter how firm may be his own conviction of the character of a disease.

LE ROY PARKER,

Flint, Mich., Sept., 1882. *President State Board of Health.*

A young man at work in Flint was exposed to the disease, went to his home in Mt. Morris township, and the disease not being recognized, others were exposed, and seven cases resulted with two deaths. Dr. F. A Cady, health officer of Mt. Morris township, on August 4, 1882, reported the measures for restriction as follows:—

Establishing rigid quarantine, not only in respect to those who were actually sick, but to those who were exposed, until the time of incubation was past; to those who were taken sick from any disease until it could be positively determined whether the disease was small-pox or not; to those recovered until a certificate of freedom was given; to houses (clothing, etc , therein) until a certificate of freedom from infection was given; the appointment of a marshal to enforce the regulations. It was checked at once. No new cases since. One is convalescing now.

Dr. H. R. Thomas, health officer of Burton township, Genesee county, reported one fatal case of small-pox, which had its probable source of contagion in the cases at Flint. He died on July 25.

George Mackenzie, health officer of Montrose township, Genesee county, reported, August 2, a case of small-pox, source of contagion unknown; it recovered. Thorough isolation, vaccination, notices, disinfection, etc., restricted the disease to the first case.

GRAND TRAVERSE COUNTY.

Dr. L. F. Ingersoll, health officer of Bingham township, Leelanaw Co., reported on Dec. 5, 1881, that a case of small-pox developed at the Bay

House, a hotel in Traverse City, which probably had a common origin with the cases in Bingham township, Leelanaw Co., namely, the schooners Perry Bronson, and Helen Pratt, which came from Chicago and were loading with wood along the coast of Traverse Bay.

Mr. C. W. Williams, health officer of Kasson township, Leelanaw county, on Dec. 23, reported that one Frank Foster, who was a printer in the "Eagle" office at Traverse City, was taken ill about Sept. 23, and he was taken to his father's house in Kasson township, where it was afterwards decided that he had small-pox, and where he communicated it to at least four persons, one of whom and Frank died. This may be the same case that Dr. Ingersoll refers to, but it is not known positively, as the health authorities in Traverse City did not respond to our inquiries. An account of small-pox in Leelanaw county may be seen on pages 416 and following of this Report.

INGHAM COUNTY.

Dr. J. H. Wellings, health officer of Lansing, reported a case of small-pox in July. By his prompt and skillful management the disease was confined to the one case.

IONIA COUNTY.

Josiah Dilley, president of the village of Portland, telegraphed to this office Aug. 1, 1882, as follows:—

We want an expert here immediately. Please answer quick.

The following telegram was immediately sent Mr. Dilley:—

Expert for what? If to diagnose small-pox employ Dr. J. J. Mulheron, government inspector, Detroit, or Dr. Thompson, Flint.

Mr. Dilley telegraphed at once to Dr. Mulheron, sanitary inspector for the National Board of health at Detroit, who went to Portland the next day, Aug. 2, and the following is his report of the condition in which he found an outbreak of small-pox at that village and in the adjoining townships:—

On Tuesday evening, Aug. 1, I received a telegram from Mr. J. Dilley, president of the village of Portland, Ionia county, in this State, requesting me to take the next train for that place to "diagnose cases of small-pox." I accordingly left Detroit on the 5.45 A. M. train, D. L. & N. R. R., on the following day, arriving at Portland at 9.55 A. M. I was met at the depot by Mr. Dilley, who conducted me to the office of Dr. Dellenbaugh, the local health officer. Here I was met by Drs. Dellenbaugh, Massey, and Allen, from whom I learned that there were in the village and adjoining townships, Orange and Sebewa, a number of cases of eruptive disease, regarding the nature of which there existed a difference of opinion among such of the local physicians as had seen them. Dr. Dellenbaugh, the health officer, had committed himself to the opinion that they, or such of them as he had inspected, were cases of chicken-pox, and had therefore taken no effective means to secure isolation. Drs. Massey and Allen were pronounced in their opinion that the cases they had seen were small-pox. Of the other local physicians, Drs. Alton, Hugg, and Willey, I was informed, had pronounced the prevailing disease to be chicken-pox. Drs. Massey and Allen had been so decided in their opinion that it was small-pox, and had so persistently published such opinion, that the community had demanded a diagnosis by an "outsider."

The only case then in the village was that of a young man under the care of Dr. Alton. In company with Drs. Dellenbaugh, Massey, and Allen, I visited this case, being joined on the way by the attending physician, Dr. Alton. On reaching the house I noticed that it was placarded "chicken-pox," and on intimating that the law did not require such placards to be posted, was told that this had been placed on the house to allay the suspicion in the community that the case was one of small-pox. On entering the house I was met by and introduced to case 1.

Case 1,* Miss Haire, whom I pronounced to be recovering from a very recent attack of small-pox, the forehead being pitted and the arms presenting the characteristic bluish-red color following the shedding of the variola crusts.

Case 2 was that of Mr. Haire, a brother of the first. He was found in an adjoining room and presented a distinctive case of the confluent form of small-pox in the pustular stage.

* Cases are numbered in the order of their visitation by Dr. Mulheron, and *not* in the order of their occurrence.

Case 3, Mr. Moorehouse, was next visited. This person presented three or four scars of recent pustules which were, however, not sufficiently distinctive to warrant a diagnosis, although the symptoms premonitory to the appearance of the eruption as described by the patient and his medical attendants, Drs. Smith and Dellenbaugh, caused me to believe that the case had been one of varioloid.

Case 4. This case was that of Mr. C. Frank, an old man, whom I saw at his home five miles from Portland. He was under the care of Dr. Allen, who had pronounced it a case of varioloid, in which opinion I concurred.

Case 5 was that of Mrs. Williams, also a patient of Dr. Allen's, and living on the adjoining farm to Mr. Frank's. It was a case of discrete small-pox, and had been so pronounced by the medical attendant.

Case 6, half a mile from Mrs. Williams, a Mr. Frank Osborne, another patient of Dr. Allen. This case had been diagnosed as small-pox by the attending physician, and I found it to be one of the confluent variety.

Case 7 was found at the the house of Jesse Haire, about a mile distant from that of the last patient. It was a case of varioloid. In this family were found two children, Eddie and Rollin, children of Mr. Haire, who were pitted and bore the other distinctive marks of recent small-pox.

Cases 8 and 9. These I found at the house of another member of the Haire family, about a quarter of a mile distant from the last. They occurred in a man and elderly woman, whose names I do not recall and were of the discrete variety of small-pox.

Cases 10, 11, 12, and 13 were reached after a walk of a mile through a swamp, it raining heavily the while. These were in Lydia Seiler, Maggie Seiler, Jacob Seiler, and William Seiler. In the cases of Lydia (aged 45), and Jacob (aged 47), the disease occurred in the form of varioloid, these two having been vaccinated in their youth. William (aged 13), and Maggie (aged 11), children of the former, had never been vaccinated, and they were down with confluent small-pox.

The condition of affairs as above reported was stated to Mr. Dilley, president of the village of Portland, and he and Dr. Dellenbaugh, who accompanied me on the inspection, at once instituted means for the prevention of the further spread of the disease. Dr. D. on our visit to these left strict orders that none of the members of the family should enter the village of Portland while their houses were under quarantine.

The origin of this outbreak of small-pox is somewhat obscure. The first case which occurred was that of Eddie Haire, in whom the eruption appeared on June 5. There was no history of known exposure in this case, although there were vague rumors, which I found it impossible to authenticate, that parties who had been on a visit to Flint, during the prevalence of the disease in the neighborhood of that city, had visited the Haire family on their return. The family, who were closely questioned, were not cognizant of any such visit.

The spread of the disease from this first case is easily traceable. On the occurrence of the eruption, Dr. Houghton, of Tremaine's Corners, who had been called to see the boy during the prodromal stage, at first pronounced it scarlatina. On his visit next day he changed his diagnosis to that of possible small-pox, and on the third day he committed himself finally to the opinion that it was neither scarlatina nor small-pox, but that it was erythema. He furthermore, it is said, was positive in his assurance that the affection was not of a contagious nature, and encouraged rather than restricted intercourse with the family by the neighbors.

The next case occurred in the person of Rollin Haire, a brother of Eddie, and living in the same house. The eruption appeared after the usual headache, backache and fever, on the 20th day of June. This case was also treated by Dr. Houghton, and was also diagnosed as erythema.

The next case was that of Mrs. Wm Haire, who was taken with the usual prodromal symptoms of small-pox on the ninth day after a visit to the family of Jesse Haire. Mrs. Haire was treated by Dr. Alton, whose diagnosis was of some non-contagious eruptive disease, with a positive opinion that the disease was not small-pox. The case rapidly (within five days) proved fatal. I am of the opinion, from the description of the case, as given me by Dr. Alton, that it was one of hæmorrhagic small-pox (purpura variolosa). There was no appearance of papules or pustules, but numerous and extensive "ecchymosed" spots were distributed over the body. The disease occurred at the woman's menstrual period, and the metrorrhagia was very profuse. Before death the skin sloughed off in patches over the purpuric spots.*

Mrs. Haire's funeral was conducted by Mr. Morehouse, referred to as case 3 in the above report, and was attended by the neighbors and friends generally. Eleven of the thirteen cases mentioned above were seized with the affection with which they were suffering, at the date of my visit, in the usual time of the occurrence of small-pox, after the date of exposure at this funeral.

Dr. Massey, who was in attendance on the Seiler family at the time of my visit, having been called in after the dismissal of Dr. Houghton, who was first in attendance, and who also pronounced these cases to be erythema, even after they had reached the pustular stage, has kindly furnished me with the following summarized report of these cases:—

* I expected to have embodied in this report a minute description of this case from the pen of Dr. Alton, but have not been favored with it at this writing.

Lydia Seiler: Premonitory stage set in July 23. Papules appeared July 27. Bursting of pustules and commencement of desiccation August 4.

Maggie Seiler: Premonitory stage set in July 23. Papules July 27. Bursting and desiccation August 5.

Jacob Seiler: Premonitory stage set in July 27. Papules July 30. Bursting and desiccation August 6.

William Seiler: Premonitory stage set in July 25. Papules July 29. Bursting and desiccation August 4.

Owing to the difference of opinion, as above noted, among the attending physicians, there has been a very serious amount of exposure, and during my inspection two cases were noted in which there were the characteristic headache, backache, and other prodromata of small-pox.

I would submit, as a comment on the occurrence of this disease, as above outlined, that it has in it a lesson which physicians not familiar with variola would do well to heed, in the interests of public health. They should be very guarded in their diagnosis of eruptions following a few days of fever It is one of the weaknesses of human nature, and perhaps particularly apparent among physicians in the matter of diagnosis, that consistency is a jewel, whose purity must be maintained even at the sacrifice of other qualities, not to say honesty of conviction. Having once given a pronounced opinion, there is a strong temptation to the physician to collect, and perhaps distort facts to support it, and it is to be feared that both at Flint and at Portland the unfortunate prevalence of small-pox is largely due to a yielding to this temptation.

E. P. Williams, health officer of Orange township, Ionia county, furnished on September 11 the following account of small-pox in his township, where was attacked the first person taken sick in the outbreak reported by Dr. Mulheron [not his "case 1," but Eddie Haire, mentioned under his "case 7," and in a succeeding paragraph]:—

Copies of the revised document have been received and used to best advantage possible; also copies of circulars 34 and 55. Small-pox in this vicinity first appeared in this township in the family of one Haire, two of his children coming down at the same time. The attending physicians pronounced it a skin disease and not contagious. From this family it spread to others in the neighborhood, until a Mrs. Haire died and was publicly buried, about 30 at the funeral being exposed. Immediately after the funeral of Mrs. Haire, Dr. Allen, of Portland, was called in to examine a patient in the same family, and unhesitatingly pronounced the disease small-pox, and immediately notified me. Prompt and decisive measures were taken to prevent the further spread of the disease. The neighborhood was quarantined, and the families and individual cases isolated as much as possible. The means used has proven so effectual that no other families have taken the disease, and to-day we have not a case in the township. There have been 30 or more cases and 4 deaths.

The best known methods of disinfection have been advised, and I am assured have been employed. We are not apprehensive of further trouble with this outbreak. The cause of the outbreak here is unknown.

John H. Cook, health officer of Sebewa township, Ionia Co., sent on August 29, the following report of small-pox in this township, from which it appears the disease was contracted by residents of his township while in attendance on the funeral of Mrs. Haire, of Orange township:—

I hasten to reply to your letter of the 21st, and I will here state that you have my thanks for the small-pox documents which you so kindly sent me. They were immediately distributed where they would do the most good. I will now reply to your instructions and questions in regard to the small-pox.

As to the source of the contagion, it is believed to have proceeded from exposure at the funeral of a lady who died of small-pox in the town of Orange, which joins Sebewa on the north, the physician attending the case having formed an incorrect diagnosis. The funeral was therefore public and largely attended. We have had thirteen cases in the township of Sebewa. These cases are all confined to two families and are traceable to the above-named funeral. Three cases of the thirteen have been fatal. There are no more to come down with the disease in these families, and I think the disease is stayed. I have taken all possible precautions against its spread, and I think with success. When the first case was reported I posted a small-pox notice in front of the house and also painted two signs to the same effect and nailed them on posts in the center of road one mile each side of the residence. I closed the school in the neighborhood, and other schools and meetings and public gatherings of every kind within the distance of three miles. I restricted every one who had been exposed to keep on their own premises, fenced the road on both sides at a distance of 100 rods, visited the families and gave them instructions for disinfecting their habitations when they recovered, and saw that it was thoroughly carried out according to instruction in the pamphlet

you sent me. I have seen both families to-day and they are doing well. There are no new cases in Sebewa to-day. I think vaccination has been pretty thorough throughout the town and will have a good effect in restraining the disease.

Dr. L. A. Houghton, health officer of Berlin township, made on Sept. 12, the following report of small-pox in his township, into which it was introduced from Orange township:—

Your favor of September 8 was duly received, and in reply to your question as to why I had not reported the cases of small-pox, was through ignorance of my duty (being in the country where such epidemics are very infrequent.)

There are at present no cases of small-pox. All are convalescent.

Seven persons have had the disease and are still in quarantine. These persons all resided in two houses about 20 rods apart, were ordered to stay on their own farms as soon as exposed. All who had not been vaccinated were vaccinated as soon as virus could be got. All are well or getting well. The means taken to prevent its spread were written orders not to leave home until permitted, and fencing up the road one-half mile on either side of the dwellings where small-pox was even suspected. The way the disease came into our township was from Orange. Walter Lee came home after being exposed in that township. The way it came into that township (Orange) is a mystery. A little boy, who had not been from home, and who lived in a place back from the road, and who had not been from home but a few miles in his life, was the first victim. I have been with the disease in Orange since it broke out; have attended 25 cases in Orange. If any further information is wanted I will cheerfully reply.

Dr. G. W. Van Antwerp, health officer of Danby township, Ionia county, reported a case of small-pox on August 18; the source of contagion was unknown. The board of health quarantined it immediately and there were no more cases there.

A letter from Dr. F. Slocum, health officer of Ionia township, writes that he contracted small-pox while treating cases in Berlin, Orange, and Sebewa townships. His wife, children, and mother had the disease as well as himself. No deaths.

KALAMAZOO COUNTY.

Dr. B. Harrison, health officer of Prairie Ronde township, reported on Jan. 23, 1882, an outbreak of small-pox at Leesburg, a little village in one corner of the township, as follows:—

Your favor, Jan. 19, making inquiry in relation to small-pox cases in this township is at hand, and I have to report that there have been reported to me twelve cases, all in Leesburg, a small station on the Chicago and Grand Trunk railroad in the south-west corner of the township. A pest-house has been provided and all the patients are cared for therein. There have been no deaths and all the patients are considered out of danger except one, and he is thought to have a fair prospect of recovering. They are attended by Dr. Grant of Marcellus, and have good nursing. Schools have been closed in the south-west part of the township and no scholars are permitted to attend other schools in the township unless they have been vaccinated. Vaccination has been *very* general throughout the whole township.

Dr. J. M. Snook, health officer of Kalamazoo, reported two cases of small-pox reported to him during the week ending May 27, 1882. It having been charged in the public press that small-pox had been present in the village for several weeks and kept secret, a letter was addressed to the health officer asking for information on this point. The following is his reply, dated June 1:—

You have ere this received my report of cases of small-pox occurring with us during the past week. In your letter received to-day you ask if it has been quietly kept in our village for several weeks. Here are the facts as near as I have been able to obtain to the present time:—

About the 5th of May, one Joseph Woodhams, a traveling man, came to his brother's home here in K. suffering from some illness. A "doctor" was called in who treated him for five days, then another "doctor" was called in. The first states that on his last visit he mentioned to Mr. Woodhams that the case was a little suspicious, but before reporting it he would take a little more time. The following morning he was informed that Mr W. was so much better that he need not call. The second said positively that it was not small-pox. In a little time (exact I can't say), the patient was up, out, and about. All was quiet until Friday, the 19th of May, when a Mrs. Warrant, who

had visited Mr. Joseph Woodhams while sick, was taken ill. The same No. 1 doctor was called, who pronounced the case one of bilious pneumonia. He treated it along until the following Wednesday when it became *so* bilious that the same doctor No. 2 was called in, who pronounced it an aggravated case of measles, and upon being asked regarding the possibility of small-pox declared there was not the first symptom of that disease. It continued to grow "bilious" until Friday nearly noon—one week from the seizure—when I was asked by a party not directly interested to see a case of sickness where there seemed to be a little doubt as to its exact nature. This was a member of the board of trustees. I found the person sitting up in a chair feeling fairly well, but covered with eruption of small-pox. On inquiry I found the possible source, and upon visiting it—the Woodhams family—found a young man with varioloid waiting upon customers in a grocery and feed-store. I learned that a sister was similarly ill at the farm about two miles out, and sent the health officer of the township out who reported it also a case of varioloid. It has been with us since the 5th of May. Yesterday the person to whom I was first called died. It was in its worst form, she having never been vaccinated. As soon as we can have our witnesses from among those under surveillance we shall proceed to find where the responsibility rests.

On July 3, Dr. Snook reported small-pox as having disapeared, having been confined to the families where it first appeared.

Dr. H. H. Schaberg, health officer of the township of Kalamazoo, went to see the niece of the first case in the village, and the following is his report, dated June 17, 1882:—

Herewith I forward you cases reported to me as *Health Officer, Kalamazoo Township.*

Case 1. Martha Woodhams; female, aged 17; disease varioloid. I saw the case on Friday, the 26th day of May, and the disease was then some 7 to 8 days along, the beginning of the disease dating back to May 18 or 19, as near as I could discover. Was reported to me on Saturday, May 27, by Dr. Jas. Ayres, of this place. Origin of the disease, Joseph Woodhams, the patient's uncle.

Case 2. Lizzie Warrent, aged 17 years; disease varioloid. Was taken sick June 2d, 1882; eruption appeared June 4, 1882. This patient had been sent up to be quarantined by the village, having been exposed from her mother, who died of variola, which she, in turn, had contracted from the same, Joseph Woodhams.

Case 3. Alfred Woodhams, aged 11 years; male; disease varioloid. Saw case June 8, when eruption was first appearing. Cause of infection, case No. 1, who is his sister.

KALKASKA COUNTY.

Allen Lannin, health officer of Rapid River township, Kalkaska county, reported on July 31, 1882, cases of small-pox in his township, and in Westwood village, which is in one corner of his township, the origin of which was from Mr. Phillip Barth, who contracted the disease in Reed City, Osceola county, from a German who had just come from Hamburg on the steamship Cimbria. Other cases in other localities had a similar origin; see the account for Mancelona township, Antrim county, on page 393, and the account of an outbreak at East Saginaw, Saginaw county, on page ——. Mr, Lannin's report is as follows:—

Yours of July 29 just at hand. As regards small-pox in Rapid River township, I would say: The cause of contagium was from a carpenter from Reed City, who was taken sick at his boarding place in Custer township, Antrim county, Mich., adjoining this township, near the village of Westwood, and several cases were there in Custer before it came into Rapid River. There are just 3 cases at present in the town of Rapid River, two in the village of Westwood, and one one-half mile out of town, or village. Deaths, there are none at present in Rapid River, but there were two in Custer, Antrim county.

To restrict the disease, the board of health appointed 3 suitable persons in the vicinity of Westwood, where it is, to prohibit all travel by persons known to be in contact with the disease, and, if necessary, to have license to travel from the board of health. The success has been good so far in Rapid River. As to its restriction, we have but 3 cases at the present in Rapid River. The whole 3 cases in Rapid River was taken by the parties themselves by going to see their friends in Custer, Antrim county, and not knowing that it was small-pox, and was misinformed by the physician in attendance, and also in failure of the health officer and physician both, of Custer, to report that the disease was contagious; and, furthermore, I will say that the physicians of Mancelona, Antrim county, and other places, are very negligent in reporting contagious diseases.

Mr. Lannin reported one new case and one death on August 3, and stated

that the government had stopped receiving mail on the trains passing through Westwood.

Mr. James Campbell, postmaster at Westwood, Kalkaska county, wrote the following valuable history of small-pox as it appeared in that vicinity, his report being dated August 7, 1882:—

I will try and give you the history of a contagious disease that has been in this vicinity since the 16th of May last. It was brought by a German carpenter named Philip Barth, whose home is at Reed City. He went to work for a man named Hosmer, in the township of Custer, Antrim county, about four and a half miles from here. After working three or four days was taken with an eruptive disease, which was pronounced chicken-pox. He kept right on to work, only losing one-half day. About ten days after he was taken sick the man he was boarding with, James Lively, was taken with the same, also his two children, but his wife escaped without taking it. The man he was working for, Mr. Hosmer, also took it. Mr. Hosmer had it very light, just a few pimples appearing. He kept his bed about two days on account of the headache, which preceded the eruption. Mr. Hosmer was not vaccinated; he is one of the anti-vaccination men. Mr. Lively had the disease much worse than Hosmer; his face all broke out in big blisters, and swelled considerably. His little boy had it very bad; broke out all over in large blisters; his face swelled up until he could not see the least, and his cheeks were about level with his nose. His little sister did not have it nearly so bad; in fact she was up and around the house every day. The little boy is five years, the girl eight, Mr. Lively himself about forty. He had been vaccinated some time in his life. The children never had been. Dr. Cosford, of Mancelona, about 3½ miles from their place, was called to see Lively's little boy four times. He did not call it the small pox, and if he did not say it was the chicken-pox he did not say it was not. A brother of mine, John Campbell, who is a young man of 30 years, and owns a farm opposite Lively's, was there to dinner shortly after Barth broke out with this disease, and he also took it from him, coming down in about two weeks after being exposed. When he felt himself getting sick he went home, covered himself warm in bed, drank plenty of cold water, got himself sweating freely. When the eruptions commenced coming out he felt much better. There were very few of them altogether, and they dried up in a few days. He had been vaccinated a few years ago.

The next one to take it was a sister, a young lady of 21 years. She broke out all over her body with large white blisters, mostly oval-shaped, and would average the size of a common white bean. Her face was worse than the rest of her body. She was kept in bed about three weeks, but has fully recovered about three weeks ago; that is, it is about 6 weeks now since she was taken sick. She never was vaccinated. Dr. Cosford attended her. He never named the disease, but gave them to understand that it was chicken-pox. She lives with my mother, about 2½ miles from here, and when the disease was at its worst I went to see her; was much alarmed; sent to Kalkaska for Dr. Johnson, went with him to see her, and requested his opinion as to what the disease was. His reply was, that as the blisters were not sunk in the centre he could not call it small-pox, but that it was worse than any chicken-pox he ever saw. He afterwards said that perhaps it was a disease called German measles, so called from having been diagnosed by a certain physician in Germany. Next my mother, an old lady of 69 years, took the disease, but it scarcely took her off her feet, and the eruptions were very few. She had some time or other been vaccinated. Next, a young man, a neighbor of theirs named Sam Beers. He also had it very light. The eruptions were middling numerous on his face, but soon dried up. He was kept in bed two or three days. He is about 17 years old, and never was vaccinated. His father and mother also took it about the same time, but had it so light that some think they never had it at all. I understood that they never were vaccinated, but may be mistaken, as my information on that point is not from themselves. The next cases were my father, Angus Campbell, 79 years of age, who had been vaccinated, a brother William Campbell, about 28, and a brother Angus Campbell, Jr., 25 years, neither of whom had been vaccinated. The last mentioned was having it in its severest form, had got fully broke out in blisters, when he arose from his bed in the night, went to the well and took a bath of cold well water, causing all the eruptions to strike in. Dr. Cosford was not able to do anything to relieve him, and he died in three days. My father, Angus Campbell, Sr., had the disease very light, had very few eruptions, none of them blisters; in fact, was almost over that disease when the young man died, but with old age, some kind of chronic pleurisy, or some other lung disease, and grief, he died within one week of his son; was walking around within five minutes of the time he breathed his last. The other brother, William, had it much the worst of any who had yet taken the disease. He was one mass of blisters from head to foot, his head, and particularly his face, being the worst, and swelled to double its original size. The blisters were same size and shape as my sister had. He was attended first by Dr. Cosford, afterwards by Dr. Beaver, of Mancelona, neither of whom called it small-pox.

On Monday, July 17, I found myself dizzy and not feeling just right. Next day, Tuesday, I felt worse, very light-headed and altogether unable to attend to business. In the evening was taken

with a chill, and went to bed. In about 36 hours afterwards I began to have some eruptions; then I felt comparatively well. Before the eruptions came out I felt as if I had been completely burned up. I had it quite light, only remaining two days in bed altogether. In fact I had to get up as my wife was taken down and no one to wait on her but a girl of 15 and another of 12 years. I had very few eruptions, no blisters, and they were all dried up within nine days of the time I was first taken. I am 37 years of age, was vaccinated, but before I can remember. They say it took well. My wife who is rather a delicate woman 27 years of age, and was vaccinated last spring and the vaccination took well, has had the disease very hard. I have had more chance to observe the disease on her than on others. After being sick about three days she commenced breaking out with a scarlet rash. In about 24 hours more these began to take the form of blisters, then continued to enlarge and fill with a whey-colored fluid for about four days more. In about a week they commenced to dry up, aud have been about a week drying up. She was first under the care of Dr. Johnson, of Kalkaska, who told me he could not call it small-pox. Said it was not small-pox, but was perhaps the German measles, I mentioned before. Upon his third visit some one on the street told him that Dr. Cosford had pronounced it small-pox (which was not so). He answered that he could not exactly call it small-pox, but would find out next day. That coming to my ear I dismissed him at once and employed Dr. Morgan, of Kalkaska, who, on his first visit pronounced it small-pox. He called three times and said as she was getting along all right he did not think it necessary to come again unless she got worse. In a day or two afterwards her symptoms were somewhat worse, when I employed young Dr. Beaver, of Mancelona, before mentioned, and he continued to treat her case until she got well. The blisters on her had more the shape of genuine small-pox than any of the others that came under my observation, as they were most of them nearly round and were also most of them shrunk in the center, looking somewhat like a small button. We have now three cases in our home. One a young lady of 18 years. She has it bad but mostly in the face. The blisters are just forming. There are very few on the limbs, and comparatively few on the body, more on the arms, and as I said the face is very bad. She has never been vaccinated. Next we have a girl of 15 years. She is very sick, is covered with this scarlet rash that precedes the blisters in the severe cases, and blisters do not seem to be forming as they should. This girl was vaccinated by Dr. Cosford last spring and the vaccination took well. Next we have a girl 12 years of age who has had it very mild, scarcely having to go to bed at all. Do not think she has over 25 to 30 pimples on her body. She never was vaccinated.

Besides the above described there was an old man named Simon Fraser. He lived in the township of Rapid River, Kalkaska county, about one and one-half miles from this village. He had been for the past three years a public charge. He was in very bad health, covered with offensive sores of some kind, and lived in a shanty in as miserable and filthy condition as you can well conceive. He took this disease and as the eruption was coming out he died. There was an attendant who was supplying him with food, medicine, etc., and not able to say whether he had ever been vaccinated or not. Besides the above described cases, there are in the family of C. B. Beers, before mentioned, two children now sick. They are reported to be doing well. Also the wife and three children of Mr. Hosmer, mentioned as one of the first to take this disease, are down with it. They have all had it, being light except one little boy; he is having it pretty hard, but is doing well. They had none of them been vaccinated; for, as I mentioned before, Mr. Hosmer is an anti-vaccination man. I understand that the Beers children have not been vaccinated. Among the last to be taken is a man living in the township of Custer about two miles west of Mancelona, David Lively, a brother of the James Lively first mentioned. His two children first took it, having caught it from their little cousin. They are having it very light. Mr. Lively himself has just come down with it. Cannot say yet how it is to go with him. I am informed that he was vaccinated some time but that the children never have been. Have got my information of these last from their aunt, Mrs. James Lively. I believe that I have given you a tolerably minute and correct description of this disease from the time it has appeared here till the present time.

P. S.—Aug. 10. As they have stopped mail going from this place this had not been sent yet. Our girl, aged 15, that I reported as very sick, died this morning just as the blisters ought to have come out. Her monthly period arrived, and was much more than it should be. The eruptions never came out as they should, which seemed to be the cause of her death. The other girl, 18, is having it much lighter than we expected, and will soon be well. What can be the reason that in our family those who were vaccinated had it so bad, and those who were not had it light, or comparatively so?

Mr. Campbell reported additional cases on August 21 in the following letter:—

In reference to the small-pox here there have been three new cases since my other letter, two girls, one 10, the other 12 years of age, daughters of the old man Fraser, the county charge that I mentioned in the other letter as having died, and the other was a man named Napoleon Boughton, aged about 24, who waited on Fraser during his sickness. They were all vaccinated. The little girls had it quite light, and are almost recovered, but Boughton died last evening. The eruptions did not come out as they should. It appears he had venereal disease very bad. Perhaps that may account for the way the disease terminated in his case.

In my former letter I mentioned C. B. Beers and wife as having the small-pox very light, and that I was informed that they had never been vaccinated. I have enquired of themselves, and find that they both had been vaccinated, Mr. Beers twice and his wife once, but that their children never had been. Many of us think that some of our doctors displayed altogether too much ignorance in allowing the disease to rage about two months before being able to find out that it was small-pox.

My wife and her sister that died were vaccinated by Dr. Cosford last spring. They had the disease much worse than the other two members of our family, their sisters, who had never been vaccinated. Am at a loss to account for that. I enquired of a physician, and his theory was that Cosford used humanized virus which had lost its power. As it worked well could this have been the case? Dr. Cosford, at the time of performing the vaccination, guaranteed that he was using pure bovine matter.

The three preceding letters describe an outbreak of 29 cases of small-pox, with five deaths, which originated in a case of small-pox occurring in an immigrant in Reed City, Osceola county, just arrived from Hamburg, by the steamship Cimbria. The details of the disease in Reed City will be found under Osceola county. If this immigrant had been vaccinated successfully on ship-board, and possibly at New York quarantine, perhaps he would not have contracted the disease, and this fatal and expensive outbreak would not have occurred. Another lesson to be learned from this outbreak is, that in case of doubt as to the true nature of a suspected contagious disease, the benefit of the doubt should always be given to the public, and the case should be managed in such a manner that no one should be endangered in case it should prove to be small-pox.

KENT COUNTY.

Dr. S. R. Wooster, then health officer of the city of Grand Rapids, reported on Nov. 27 a case of small-pox in a thickly-settled part of the city, adding significantly, "no hospital, no pest-house, no defined duties for health officer." The source of this case is given in the following letter dated Dec. 3, 1881, from Geo. A. Love, president of the board of health:—

Some time during October a Mrs. Rogers, living at No. 80 Seagrave street, visited Chicago and shortly after her return was taken ill and a physician called, who pronounced it a case of malarial fever. During her illness her friends (including Mrs. Kinney, the lady now down with small-pox) called on her freely. On Thursday, Nov. 24, Mrs. Cook, the mother of Mrs. Rogers, and living in the same house, was taken ill with same symptoms as Mrs. Rogers, but no doctor was called. On Monday last, hearing that Mrs. Kinney was down with small-pox Mr. Cook called on the physician who had attended Mrs. Rogers and asked him if he had not made a mistake in the nature of the disease. The doctor called on Mrs. Cook and after an examination was not certain and requested council. Dr. Brady, living in the next house, came in and pronounced it a case of varioloid. Since then no physician has been employed in the case, but the patient is nearly well. No report of this case has, in an official way, been made to this board and the facts only came out during the investigation made by me. I at once placed a guard around the house and posted small-pox cards, and all are strictly confined in the house, the *dog* included. I have placed the case in the hands of the prosecuting attorney and expect to be able to make out a good case. Shall do the best I can.

Our city officials are now willing to give us what assistance they can. What action has been taken by them you will see by enclosed clippings. I have now four special police on duty at the two infected houses, keeping one on duty at each place day and night, and unless more cases break out we shall do very well.

Mr. Love reported Dec. 9 two cases of varioloid in the same house with Mrs. Kinney, and one new case of small-pox in a public house which was placed in a temporary hospital with a good nurse.

Mr. Love reported on Dec. 16 two more cases as follows:—

We have received this day reports of two more cases of small-pox in one house, father and son. They may make us some trouble as the wife and sister of the son have been doing washing for some of our best families. In fact washing was returned to the family of one of our attorneys only last evening. We have notified them of the cases. Have taken strict measures of quarantine, and as the residence is on the extreme east of the city in a thinly settled neighborhood, there

will be no spread there. Shall make an investigation of the cause to-morrow and if I can trace it out will inform you.

Mr. Love reported the last two cases as dead on Dec. 21. Three persons in the same house, though not sick, had been removed to the hospital for contagious diseases.

Mr. Love reported a new case on January 2, 1882, entirely distinct from the others, and believed to have been brought from North Carolina, as the parents of the case had only been in the city ten days.

On Jan. 17 Mr. Love reported one child as having died of small-pox, and the mother and another child then sick. The last two cases were removed to the hospital. On the same day he reported three new cases, a woman and two children, contracted at the house of a brother of the woman's where the child above referred to died. Of a brother of these last cases Mr. Love says:—

One son was at work yesterday in one of our large furniture factories. He is now at home, and the house under strict quarantine. With Dr. Wooster I visited the house yesterday, immediately after notice. I have notified the president of the factory where the boy was employed, and requested him at once to cause the employees to be vaccinated.

Dr. C. H. Maxim reported one new case on Jan. 18.

Mr. Love reported two new cases on Jan. 23, as follows:—

We have this morning two new cases of small-pox; one an adult 44 years old, and a child eight days old. The mother was sick with small-pox at confinement and is doing finely. Our present cases all spring from one. On new years eve a party was held at a house where a little girl was ill of *measles*, as the parents thought, but on Monday, Jan. 2d, a physician was called and pronounced it small-pox. We have now on our hands eleven patients, all Hollanders, and all of them attended the party.

Dr. Maxim and Mr. Love reported two cases of varioloid on Feb. 3, in persons quarantined in houses where other persons were sick with small-pox. They also reported that the baby which was born while its mother was sick with small-pox had died.

On Feb. 7, Dr. Maxim and Mr. Love reported a case of small-pox in a man in a second-class hotel who mingled freely with the inmates of the hotel the day before the eruption appeared. He was removed to the hospital as soon as the nature of the disease became known. The patient had been in Grand Rapids 10 days.

On Feb. 13 Mr. Love reported one new case of small-pox with the following history:—

To-day we have one more case of small-pox. On Jan. 23 John McCullough was run over by cars and leg badly crushed. On the 24th the limb was amputated, he being at St. Mark's home, a benevolent institution here, and late last evening his attending physician thought he had small-pox and called Dr. Wooster, who at once decided it a genuine case. It seems strange that after being confined to the house 21 days he should come down with small-pox.

The physician attending him has not been near any small-pox, and there has been none of the inmates of the Home exposed, as we can learn. The case is quite mild, and he is doing well, although he is rather weak from the amputation.

On February 24, Mr. Love reported that they would discharge their last small-pox patient, and stated that there had been in all, since Nov. 27, 1881, 26 cases of small-pox and varioloid, with 5 deaths. Three of the fatal cases were complicated with lung troubles, and one with measles.

Grand Rapids was not to be long without small-pox, for on March 21 Dr. Maxim reported a man just coming down with the disease, who had just arrived with his wife from Chicago. The man was placed in the hospital before having entered any house. The woman, however, endeavored to get away, but was hunted up and placed in the hospital.

On March 28, Dr. Maxim reported a new case in the following letter:—

I have to report another case of small-pox, bad. The man came here Saturday last and went to a

low class boarding-house near Union depot, being sick at the time. Since then till this morning he has been loafing around the boarding-house, at the depot, and on the streets. Yesterday he visited one of our physicians, who diagnosed his case as "bilious fever," prescribed for him and sent him on his wandering way. This morning early he was taken up by a policeman. City physician Wooster happened along just then, took him in charge, and in five minutes he was en route for the pest house. But the almost certainty is that he has infected a large number, for the place where he stopped is a liquor saloon, visited by hundreds daily, and in the worst and most unsanitary part of the city.

Hitherto we have been very fortunate in these cases, but I fear we have got a heroic dose this time. Will report developments as they may come. We have burned about 10 pounds sulphur and used carbolic freely in the "shebang" where he stopped.

Mr. Love succeeded Dr. Maxim as clerk of the board, and Dr. Wooster, as city physician, was succeeded by Dr. Horatio S. Holden. On May, 5 Mr. Love reported a case of varioloid, as follows:—

We had a case of varioloid last night which we placed in the hands of the new city physician to take to pest-house. The doctor sent him on foot and this morning he can't be found. We expect he has gone to his father's house in Paris township.

On May 8, Mr. Love wrote as follows regarding this case:—

After writing you last of the case of varioloid I sent a letter to the father of the young man on the subject. To-day I received an answer from the young man himself. He states he is entirely well and the doctor there (Fisher Station), said it was a very mild case of chicken-pox. Dr. B. who had him here, told Dr. Maxim to-day that he was confident it was varioloid, and in his opinion, other members of the family would be ill of varioloid.

The following is from the Grand Rapids Eagle of May 11, 1882, regarding this case:—

VARIOLOID.—One Daniel Shine, a young man whose parents live in Paris township, and who has recently returned from near Whitehall, where he had been at work, called on Dr. Brady last evening for medical assistance Dr. Brady concluded that he was suffering from a mild case of varioloid, and at once notified the board of health. City physician Holden was notified and agreed with Dr. Brady, as did Dr. Maxim, ex-city-physician. Shine said that he would prefer going to the pest-house for treatment, thus avoiding the exposure to his family and friends, and it was decided to send him there. He was able to walk and said he would go there himself so his promise to do so was accepted and the board made preparations for caring for him. He left Dr. Brady's office, didn't go to the pest-house, and hadn't been seen or heard of since by the health officers at 10 o'clock this morning. However, the doctors seem to think he is not likely to scatter the infection and do not worry about the case.

M. A. Shaffer, M. D., health officer of Paris township, Kent Co., wrote in reply to a letter regarding this case, as follows, dated May 29, 1882:—

One Daniel Shine was sent out from Grand Rapids with the small-pox, as so stated. Three days after, I saw him and I pronounced it chicken-pox, and after waiting this long time for any other developments, if there should be any, there are none and Paris is free from small-pox.

On May 21, Mr. Love reported a fully developed case of small-pox in a man arrived there on May 19 from Iowa.

On May 22, Mr. Love reported another case of small-pox in a man who arrived from Chicago May 19.

On June 3, Mr. Love reported another case as follows:—

We have to-day one more case of small-pox, a youth twelve years of age, his parents and self having been exposed by being quarantined in the house where one of our former cases was, we had reason to expect them to be ill, as they positively refused vaccination. The patient in same house died. One we have now in hospital is very sick; hardly an even chance for recovery.

Mr. Love reported, on June 7, a case of small-pox in a quarantined family. On June 6, he reported three new cases and one death, as follows:—

Three new cases of small-pox have just been reported to me. Our one patient in hospital died at 5 P. M. to-day. We will bury him at 9 to-night. I am told by one doctor, reporting cases to-day, that he has two more; that although not certain, still he thinks they have small-pox, and will report in the morning. I shall visit all the infected places this evening.

On June 7, Mr. Love reported a new case as follows:—

We have this A. M. one more new case of small-pox, making six cases under our charge. One of the parties reported yesterday is father of five children, and as a matter of course has fully

exposed all of them. Himself and wife positively refuse to allow any of the family to be vaccinated. We have closed the house and will keep them all under strict quarantine.

On June 9, Mr. Love reported new cases as follows:—

We are having a bad time with small-pox. Three cases and one of varioloid reported yesterday. One each of small-pox and varioloid at this writing to-day. We cannot account for it only on supposition of a case among new arrivals that was not reported to us. Our patients are all, except one, in same neighborhood, Germans and Hollanders. They are being attended by different doctors, so we have hard work keeping track of them. Are to-day trying to get a meeting of council for to-night, to authorize us to employ a temporary health officer, to attend all the cases, and assist us in checking the outbreak.

On June 10, Mr. Love reported one death, and one new case situated over one mile from any existing cases. The case was a domestic, who said she had not been down town or away from the house in over three weeks. On June 12 Mr. Love reported two new cases and one death. On June 14 he reported two new cases. On June 21 he reported two cases of small-pox and one of varioloid, the two small-pox cases being Holland children who never had been vaccinated, and their parents refused to allow them to be vaccinated. On June 24 he reported finding a Polish family of 8 persons with a child just dead from small-pox, and two others ill with it. The child was buried, and the family removed to the hospital, and Mr. Love reported that they expected more cases among the Polacks in that vicinity. On June 29 Mr. Love reported as follows:—

For ten days past I have been on continual duty from 8 A. M. until 10:30 and 12 P. M. We have now some 30 cases, including convalescents. Three new ones yesterday, one death last night. All others seem to be doing well to-day. What makes the work so hard here now is the cases are nearly 3 miles from my office, and I must visit them all at least twice each day to see if all is well, and guards doing duty, and am obliged to go on foot, some cases being in a swamp.

On July 1, Mr. Love reported one case of varioloid as follows:—

We have one case of varioloid reported yesterday. Her husband has been sick from reported chicken-pox, very ill, and now attending physician reports the wife as ill of varioloid. The chances are strong that the first case should have been reported the same. Free access has been allowed by the family to all friends, and many have called. The house is now under full quarantine. All other patients are doing well to-day, but two are very ill.

On July 7, Mr. Love wrote as follows:—

Two new cases are reported to-day. One of them has been ill some five days. Both are reported varioloid, mild. There are many rumors of cases, but we think we now have them all under good care, and with the exception of some exposed in quarantined places, we do not look for more. I am somewhat afraid cold weather will bring out a bad state of affairs.

On July 9, Mr. Love wrote as follows:—

Dr. Holden reports one new case of small-pox to-day; a child 13 years of age in one of the infected and quarantined houses. One death occurred yesterday. Have one *very* ill to-day at hospital; will probably drop off to-day or night. Balance are doing well. It looks now as though all are down that have been fully exposed.

On July 14, Mr. Love reported one new case and one of varioloid in an infected house. On July 17 Mr. Love reported as follows, showing the occurrence of varioloid in persons recently vaccinated, and in a man who had heretofore had small-pox severely:—

Yesterday there were three cases of varioloid in mild form reported from infected houses,—all children who have been lately vaccinated. To day one of our quarantine guards is down with same complaint. He has previously had a severe case of small-pox, and at this time has been only near enough to infected premises to learn the wants of inmates. This is very surprising to us.

In regard to the time when the man had previously had small-pox, Mr. Love wrote July 21, 1882:—

Replying to yours of 20th, the guard had small-pox some 16 years since. Cannot say as to recent vaccination; will learn and report to you. He is not very ill, sits up part of the time. No eruptions on palm of hands or bottom of feet. A few on the forehead, but mostly on breast. When he gets so I can I will make full inquiries, as this seems like a case to be enquired after.

On July 24, Mr. Love reported two cases of small-pox in a family where the father died of small-pox ten days before.

On August 3, Mr. Love reported one new case of varioloid in the same section of the city with others, in a Holland family. On August 7 he reported a new case of small-pox in a child 2½ years old, a Hollander. On August 11 Mr. Love wrote as follows:—

I have just returned from a visit to all of our patients with Dr. Holden. We have relieved two families from quarantine to-day. Have one person in an infected house that shows first symptoms to-day. We have now one dangerously sick, two that we can discharge on Monday next, and three that we must keep some ten days longer. There is, convalescents included, six cases in the city. You will see there is no very serious trouble here.

Mr. Love reported on Aug. 14 the death of the Holland child 2½ years old, and one other child who showed symptoms. No new cases had been reported for three days.

The following notice relating to vaccination was printed in the Grand Rapids papers:—

OFFICE OF BOARD OF HEALTH,
Grand Rapids, Mich., *Aug. 14, 1882.*

In accordance with the State law authorizing local boards of health, and in compliance with the recommendations of the National and State Boards of Health, it is ordered by this board that the city physician be authorized to vaccinate with pure bovine virus all persons applying for the same, free of expense to those vaccinated, and this board most earnestly advises all who have not been successfully vaccinated during the past five years to do so at once as a precautionary and economical measure against a renewal of the small-pox epidemic now happily nearing its final dissolution. This order to be in force 60 days from date.

By order of board of health. H. N. CARGILL, *President.*
GEO. A. LOVE, *Clerk.*

On Aug. 19, Mr. Love reported a new case as follows:—

To-day we have a new case of small-pox. The person came here about two weeks ago from Spring Lake. He complained of headache, etc., on the 16th. This morning eruptions came out on his forehead and the person he was staying with having had small-pox mistrusted what it was and notified us promptly. We removed him to hospital at once and fumigated the residence and shall quarantine the house for two weeks.

On Aug. 28, Mr. Love reported a case of varioloid in a lady in an infected house, who had to all appearances been successfully vaccinated when first exposed 18 days before she was taken ill. On Sept. 12, Mr. Love reported the close of this outbreak as follows:—

With great pleasure I announce that I have this day relieved our last patient from quarantine. Our city is now free from small-pox for the first time since May 19. We have have had 76 cases of small-pox and varioloid since that date, all in one section of the city.

This outbreak or series of outbreaks in Grand Rapids consisted, then, during the year, of 104 cases of small-pox and varioloid, and 28 deaths. During the same time there were 321 cases of diphtheria reported, and 73 deaths certified to have been caused by diphtheria, also 90 cases of scarlet fever reported, and 13 certified deaths from scarlet fever.

Mr. P. W. Johnson, health officer of Walker township, Kent Co., on Aug. 17 reported a case of small-pox in a little girl exposed while visiting in Grand Rapids. Her father contracted varioloid from her. Both recovered.

LAPEER COUNTY.

Dr. H. McColl, health officer of Lapeer City, reported a case of small-pox in Deerfield township, Lapeer Co., on July 23. The source of the contagium was Flint,* Genesee Co. In reply to a letter from this office Edgar Swartout, president of the board of health of Deerfield township, wrote as follows on July 30:—

We have but one case of the small-pox at the present writing. His brother informed me that he came to his place from Flint city, and denied to him of having any knowledge of being exposed to

* An account of small-pox at Flint may be seen on pages 396–403 of this Report.

the small-pox. That is where he contracted the disease. We have had no deaths from this disease.

There are four in the house quarantined at home. They are isolated from the public. We have stopped public travel by there, as the house is close to the highway. As soon as notified gave public notice of the infected place. We have had quite a number vaccinated in the immediate neighborhood, and intend to have it generally done throughout the township.

No more cases at the present time.

LEELANAW COUNTY.

Dr. S. J. Hutchinson, of Northport, reported, Nov. 6, small-pox in Leelanaw township, where it had been contracted from Bingham township,* where it had been prevailing some time. The health officer of Bingham township, Dr. L. F. Ingersoll, was immediately asked to report it, and the following, dated Nov. 20, is his reply:—

Your communication arrived yesterday, and I take this early opportunity of replying to the inquiries contained therein.

October 18 I was informed by an Indian that a death had occurred at Pashawba town, an Indian village four miles north of this place, and that the deceased had a peculiar breaking out.

It became my duty, as health officer, to investigate, so I repaired thither, taking with me the supervisor of the township. I found what I suspected, that the Indian had died from small-pox, and also that another Indian was affected in a similar manner. I found that these two Indians were engaged in loading a schooner near Traverse City, where they were, without at the time knowing it, exposed to the disease.

I gave instruction to have the dead interred immediately, and the house thoroughly disinfected. The other case is still living, isolated. The school suspended, and the same evening a meeting of the board called to decide on what steps to pursue. As a result of that meeting I was instructed to vaccinate every man, woman and child in this township. I commenced with the Indians, and have nearly completed my work in the town. Notices were printed and posted in different localities, informing the public that travel was not permissible through the village. In order that isolation might be more complete, a man was stationed at the village and provision for all the Indians supplied from this place, no Indian from that section being allowed to leave. A great many had been exposed before it was known that the dread disease had made its appearance, and as Indians are of a wandering nature, some of the exposed ones had carried the contagion into the interior, and across the bay, as shown by the disease making its appearance in two other ports of this county. Of those exposed thirty-three have contracted the disease, and eighteen have died. It has been impossible for me, as yet, to get names and ages correct, but I hope to do so soon, and will forward the same to you. If we have been derelict in our duty please inform me. We, as the board of health of Bingham township, have discharged our duty to the best of our ability, and if we have erred it is through ignorance, and any suggestion will be gratefully received and acted upon.

Dr. Ingersoll was informed that the board of health of Bingham had been neglectful of its duty in not informing this Board at once, on Oct. 18, of the existence of small-pox in that township. He was also asked regarding the name, nature, port of departure, etc., of the vessel from which the Indians first contracted the disease. His reply is as follows, dated Dec. 5, 1881:—

Your favor is at hand and so far as is in my power I will satisfy your inquiries. For two weeks previous to the development of the disease (small-pox) in the two Indians who first died, they were engaged in loading the Perry Bronson and Helen Pratt, respectively. They are schooners, and came from Chicago and were loaded at different points between Northport and Traverse City. They were loaded from the beach by Indians, as is the custom here, the wood, etc., being transported in canoes from land to the vessels, so it cannot be said that the vessels came to any particular port.

There was developed at about the same time one case at Traverse city, in the Bay House, a hotel.

Through press of business I did neglect notifying you of the existence of small-pox in our town, and not from any desire to hush the matter up, as is evident from the fact that within less than half a week nearly every person in this county was apprised of the danger and immediate steps taken to vaccinate the people and isolate the Indians. I remarked before that the Indians are a restless race, and to prevent any of the 300 residing in the northern part of this town from wandering away would require a regular picket-guard entirely round the town, which is not compact but

*An account of small-pox in Milton township, Antrim county, contracted from Bingham township, may be found on page 392-3 of this volume.

scattered for two or three miles along the beach. They are crafty, treacherous, and cannot be relied upon, and we find them very difficult to manage. They are so in fear of the disease that they steal away even after exposure, and I only wonder that no more cases in the interior have developed. Twenty-four have died, thirty-two are convalescent, and the vaccination has prevented the development of any new cases.

We offered free vaccination to each and every inhabitant of this township. There being no money in the treasury a town meeting was called and bonds voted for the requisite amount. The bonds were issued and money drawn and paid. Many question the right of townships to issue bonds to raise money for this purpose.

The close of the outbreak was reported by Dr. Ingersoll on Jan. 1, 1882, as follows:—

Small-pox has ceased spreading at last, the thorough vaccination having headed it off. Thorough disinfection has been accomplished, and yesterday bedding and clothing were furnished those who had been afflicted with the disease. All clothing and bedding has been burned. Also several houses that had sheltered a great many of the sick and were difficult of disinfection have been burned.

Mr. C. W. Williams, health officer of Kasson, in reply to inquiries from this office, wrote, dated Dec. 23, as follows:—

On or about the 23d of Sept. last Frank Foster, a "typo" in the Eagle office at Traverse City was taken sick, went to his lodgings, and called in Dr. Kneeland. The doctor informed him that he had a fever. Feeling quite uneasy he requested that he might be brought home, and was accordingly brought to his father's in this township. After the third day it was settled by father, mother, and neighbors that he had the measles, but on the fifth day it was ascertained that he had the small-pox. I was then notified, which was the first that I knew of his being sick. Prompt and vigorous measures were immediately taken to prevent its spread, and although several had been in the room, and the family had been to the neighbors, so that 20 or 30 persons had been exposed. No one out of the Foster family has had it, but the whole Foster family have had it. Frank and Jay, the two oldest sons who had it first, died. Mr. Foster next was very sick with it. Charles (the youngest son, aged 17 years), and Mrs. Foster, had it light, and are well now.

Thus far we have complied with the regulations of the State Board of Health in vaccinating, re-vaccinating, disinfecting and cleansing, just as far as it was possible in the circumstances. We have been somewhat embarrassed by the heedlessness and foolhardiness of some who were not afraid of it.

I am not a physician, and have had no previous experience in this line, and shall be pleased to receive any instruction you will be kind enough to give me in regard to my duty as health officer.

S. J. Hutchinson, M. D., health officer of Leelanaw township, reported small-pox on Nov. 6, 1881, as follows:—

I have herein to inform you that small-pox has recently broken out in this township (Leelanaw). But one case has as yet appeared, an Indian, who is the father of a family of two boys. He has been quarantined as securely as possible. His children have been removed to a separate house, while his wife stays by and nurses him. Direct communication with the patient has been prohibited. Also an officer has been appointed with full powers to intercept all Indians, or other persons, from the infected district, and prevent them from coming to town.

The infection in this case is believed to have originated from exposure to other cases of like infection, which has for some time been prevailing in the neighboring township of Bingham, of which the health officer is L. F. Ingersoll, M. D. He writes me that it originated there from two Indians, who contracted it at Traverse City, while loading a vessel there with wood. Both Indians were taken down with it, and one has since died. I understand that several deaths have occurred there, and that the disease is still raging.

On Nov. 20, 1881, Dr. Hutchinson reported additional cases in the following letter:—

We fully recognize the three main things to do toward checking the epidemic of small-pox, now prevailing in full force in this neighborhood, viz.: *isolation, vaccination*, and *disinfection*, and we shall endeavor to do what *is possible* in those three lines, as well as by all other means available, under the circumstances, that come within the sphere of *our local* duties. In our township of Leelanaw there are *three* cases (Indians) in all, so far as reported, but all within the *same house*—the father, mother and little girl. The father introduced the disease by exposing himself to it in the next township of Bingham, south of this, and between here and Traverse City, at the Indian village of *Pashawba*, or Pashawbatown, where it is now raging in full blast. He is now convalescent, while the wife is now down with it from having nursed him. She is having it lightly, so far, while the girl is quite sick. No deaths as yet, however, in this family. The rest of the family (two

boys) have been isolated and vaccinated successfully, I am informed. Had virus been at hand in time I might have saved the rest of the family from attack. It will be difficult, by and by, to keep the Indians from Pashawba from wandering through the woods to friends or relatives living in this and other townships near by. We have an officer between here and the infected district, to prevent the Indians exposed from coming to town.

It has been thought desirable or prudent to change the mail route between here and Traverse City, as the present route lays through the infected district; but as yet nothing has been done in the matter. It would seem to require a co-operation of the townships on the route and consultation with the Washington authorities.

Dr. Hutchinson afterwards reported the outbreak to be entirely suppressed.

LIVINGSTON COUNTY.

Dr. H. R. Hitchcock, health officer of the village of Howell, reported on March 24, 1882, that a case of small-pox was said to be present at Lorie's Corners, in Iosco township, Livingston county, in a lady coming from the northern part of the State. We were unable to learn anything regarding this case from the local health authorities.

MANISTEE COUNTY.

Dr. George La Montagne, health officer of Manistee city, wrote on April 15, 1882, as follows:—

On Sunday, April 9, a vessel from Chicago, in destination for Cleveland, Ohio, made port here to have medical assistance, one of the sailors being sick; it proved to be small-pox. We advised the captain to go back to Chicago, and so he did on the 12th, taking the sick man with him.

On Monday, April 10, we discovered four cases in three different houses (all Polish families.) One of these families came here about a year ago, and lost on the ocean one of their children who had small-pox. Would it be possible that the disease would have been raging among these few families ever since? I do not know, but it is probable. They never called for medical attendance, and refused to have any when everything was found out. We have taken immediately all the measures necessary to prevent the spread of the disease, and hope to succeed. The board of health, and principally the mayor, have helped me a good deal, and I mention it to you with great pleasure.

It was suggested to Dr. La Montagne that it was not necessary to suppose the disease had been raging among these families for a year, but that probably when the child died on the ocean, its infected clothing was packed away, and it may not have been disturbed since until this spring, when it may have communicated the disease to a susceptible person. There are, however, so many ways in which contagious diseases may be communicated, that it is easy to overlook most of them. Later, Dr. Montagne wrote as follows:

There has been one death, which occurred at the time the eruption made its appearance. I saw the child only after his death. Of the four cases remaining, all confluent, one is in the last period, that is desquamation, two in the third period, and one in the second period. Last Thursday, in company with two physicians, we have been vaccinating and re-vaccinating over 100, and shall continue to do so as much as possible. We have sworn an officer and appointed him to watch the houses infected, so that these people stay at home and do not come in contact with others, or be visited by others. We have taken, in fact, all the measures required to prevent its spreading, and hope to succeed.

On April 30, Dr. Montagne reported two new cases as follows:—

This last week two new cases of small-pox have been reported. They had been sick five or six days before a physician was called. We have opened a pest house now outside of the city limits, and moved them in it. The other cases are all well now. One death occurred among them last Sunday; was buried immediately, during the night. Houses have been well disinfected. Men are going to work to-morrow, so that we have at present only the two cases at the hospital.

On May 14, Dr. Montagne reported two new cases as follows:—

To-day I have discharged the cases of small-pox I had in hand at the pest house, and discovered two new cases in one family, one a girl 8 years old, being now in the last period, desquamation, the other a boy, 12, in the third period, pustules all formed. Same precautions are taken as we have with the others. Now that we are well organized, we have no trouble.

On May 21, Dr. Montagne reported two deaths in the following communication:—

At present we have two cases of small-pox in the same family; both are convalescent. Last Thursday two cases died by *lack of good nursing*, which is very hard to get now, and at any time, I suppose, in such a disease as small-pox. One of these cases was brought from the country, about 12 miles from here, in the morning, and died in the evening. The other case was sick one week before it was found out what was the matter with the patient. Lack of care was the cause of death.

Dr. Montague was informed by letter that the board of health should furnish proper care for small-pox patients, and if they died for lack of it. it was clearly a lack of performance of duty on the part of the local board. One case of varioloid imported from the country about 18 miles north of Manistee, was reported May 23. On June 2 the health officer reported the city free from small-pox, after having 10 cases and four deaths.

MARQUETTE COUNTY.

Dr. J. A. Desjardins, health officer of Marquette city, reported Aug. 20, 1882, 9 cases of small-pox with two deaths, in the following letter:—

Small-pox has been existing here about six weeks. We have had nine cases altogether; the last one is convalescent. I have done all in my power to restrict it. I have discharged all my patients, have disinfected the houses and clothes. I am almost convinced that we shall have no more cases now. I could not find the source of the contagion. We had, as I said above, nine cases, of which two died, having exposed themselves to cold. The first one when taken with high fever got her feet wet and the eruption did not come out as it ought to. The second escaped from the hospital while the nurse was out for wood, and had been exposed to rain an hour before we could bring him back to the hospital. I have isolated all those who had been exposed to the contagion, have disinfected their clothes and the houses where they were living. No more cases now.

MENOMINEE COUNTY.

Information of small-pox in Menominee Co. was first received from Peter Nelson, supervisor of Bark township in Delta Co., who wrote Jan. 23, 1882, relative to vaccination. Rev. A. W. Bill, of Menominee, reported on Jan. 28 in reply to a letter, one death from and one case of small-pox, in Menominee village, two deaths and one case in Breen township, and three cases in Spalding township. He stated that it was claimed the disease was introduced from Chicago, and that vaccination was general. On Feb. 3 Mr. Bill reported 14 cases at Spalding and four deaths among Indians at that place, and one new case in a railroad laborer was placed in the hospital at Menominee.

Daniel Fitzgerald, health officer of Breen, reported the following on Feb. 6:—

Yours of Jan. 31 is received and am happy to say that we have no cases of small-pox at present. The disease was brought here by a man from Chicago who was taken sick in one of the lumber camps on the Sturgeon river Dec. 12, 1881, and brought to this village the same day. In less than half an hour we had him in a pest-house with a competent nurse and about one mile from the village. The board employed Dr. S. D. Evans to vaccinate the entire poplation and all communication with the pest-house forbidden, except through the authorized parties. On Dec. 25 the patient was declared out of danger. On Dec. 27 two patients were brought from the same camp to the pest-house, one of whom died on Jan. 3, and the other on Jan. 4, 1882 No cases since that time, the vaccination having taken in nearly every instance, and the health in all the lumber camps being good, about the 12th of January we had the pest-house burned with its entire contents. I am happy to state that all fear of the disease is at an end, and should a case come in from any quarter we are ready to take care of it.

John F. Hicks, M. D., health officer of Menominee village, reported relative to small-pox in his village on Feb. 6, 1882, as follows:—

Yours of Jan. 31 to hand and contents noted. In reply would state that on Jan. 2, 1882, a case of small-pox developed in our village in a man aged about 60 years. He died on the 8th day of the eruption. We used every effort to keep the disease from spreading, and so far as that case was concerned were successful. On Jan. 30 another case developed 16 miles from here which I have now comfortably cared for at our pest-house about three miles from the village. It is a case of confluent small-pox, but so far seems to be doing well. If it were not for "tramps" we do not much fear any trouble from the disease as we have enforced vaccination to such an extent that I

think about all our own people are protected. We have a case or two in a house here that are doubtful, but to be safe in the matter have quarantined them. I think it only chicken-pox, as that disease is in the neighborhood, but the physician calls it small-pox. If so it is the mildest form of that disease I ever saw, and has nothing to distinguish it in appearance or duration from chicken-pox. The second case in the same family broke out 22 days after the first and ran a course of about nine or ten days. Farther up in the county there are quite a number of cases, but every effort is being made to keep the disease from spreading. Any information you may desire I will thankfully give.

On Feb. 11, 1882, the following telegram was received from Chicago:—

[Telegram.]

Send health officer immediately to Spalding, Mich. Small-pox very bad there, and becoming uncontrollable. JESSE SPALDING.

Although a letter had been sent on Jan. 30, to the health authorities of Spalding township, requesting information, this telegram from Mr. Spalding, in Chicago, was the first information received from any person directly concerned. A telegram was immediately sent to Mr. Spalding, informing him that, in this State, local health authorities deal with local outbreaks, and that this Board had no funds to pay the expenses of a physician to go to Spalding. On Feb. 9, Mr. Geo. H. Hoggerson, supervisor of Spalding, wrote the following letter:—

Your letter of Jan. 30th is at hand, and its contents noted. We have at present 4 cases of small-pox in our pest-house that we have fixed up in this township. We also have 3 cases (all children), in a private family in the village of Spalding, and several cases among the Indians at Indiantown, which is situated partly in this township, partly in Cedarville township, and partly in Delta county. We have 2 good nurses at the pest-house, and have a physician visit there twice each week. and oftener if patients are in danger. We have stationed watchmen at the infected houses to see that no person goes into or comes out of the infected houses, and also near the Indian settlement to keep the Indians from wandering around. Our physician has visited the Indian settlement and instructed the Indians how to care for the sick, and how to prevent the further spread of the disease among them.

When disinfecting a room where a small-pox patient has been, we burn sulphur, remove the carpet and paper of room and burn them, and whitewash the rooms.

We use carbolic acid and chloride of lime in all public places, and most of the dwellings, to prevent spreading.

Our board has appointed *Thomas Mooney*, (a justice of the peace of this township), as *health officer*, but at the present time the whole board are giving about all their time and attention to trying to arrest the spread of the disease.

There has been in the township since January 1st one death among white people, and I think 7 deaths among the Indians from small-pox. We had every person in the township vaccinated, and when it did not work the first time have had them re-vaccinated.

Since writing the above one physician has notified me that there are two (2) new cases in the township, one a child in the village here, and the other a man in a lumber camp, about 4 miles from the village.

On Feb. 13, Mr. Hoggerson wrote:—

Since my letter to you of Feb. 9, 1882, there have been no new cases of small-pox among the white people of this township. In the village here there are three cases (all children) in one family, and one case, a child, in another family. The first three cases are getting along nicely and will recover, but the other child is very low, and I think will die. Our physician has given up hopes of its recovery. We have both houses closed, and allow no one to go into the houses nor its inmates to come out. Anything that is needed by the people in the houses is brought to the steps of the houses by our watchmen and left where the inmates can easily get it.

Last Friday we let one of the men that had been sick in the pest house, out, as per instructions from our physician, and let him go. He had been well for several weeks. We fixed up an out-house near the pest-house, and had the man go in there and bathe himself thoroughly and put on new clothes right through that we furnished him.

We now have four cases (all men) in the pest-house, who are all getting along nicely, and will all probably recover.

The houses where these persons that are in the pest-house first took sick, we had disinfected by burning sulphur and charcoal through all the rooms, and washing everything thoroughly after being disinfected by burning sulphur, etc. We also closed each of the houses for eight days after the case of small-pox had been removed, and would not allow the inmates of those houses to go on

the streets or in any public place, or near any other person during those eight days. Is this sufficient precaution to take in such cases?

The people of this township, mostly Canadian French, are very careless about the spread of small-pox, and the health officers have had to use the utmost vigilance in keeping infected places or families isolated.

In the Indian settlement, about 11 miles from this village, the disease spread badly among the Indians. Up to yesterday evening there had been 16 deaths among the Indians from small-pox, and there were then six Indians sick with the disease. We have Indian nurses attending to the sick Indians, and send supplies, etc., to the settlement to keep them from want. We have fixed up a pest-house for them in one part of the settlement, where the patients are removed to when taken sick. We keep the Indians closely confined to their settlement to prevent danger of infection from them, and the sick Indians and nurses are kept away from the others.

I shall keep you advised of what is being done right along.

On Feb. 21, Mr. Hoggerson wrote as follows:—

Since my letter to you of Feb. 13, we have one new case of small-pox, a man named Oliver Wells, who lives about 1½ miles from this village. We have closed the house as in other cases. The Gary child that I referred to in my letter of the 13th, died the morning of the 15th, and was buried by us that same evening. No other members of that family have yet taken the disease. All the other cases of white people in this town are getting along all right, and all are out of danger.

Up to date there have been 22 deaths among the Indians at the Indian settlement from small-pox, and there are still eight Indians sick with the disease. We have had the Indians not down with the disease move a short distance from the settlement, and are giving them supplies enough to keep them from want so they will stay close at home.

On March 3 Mr. Hoggerson reported as follows:—

Three new cases of small-pox broke out in this township about one week ago: one a man living about 5 miles from this village, named Bellemore; another a man living in the village here named Lafere, and a lady living in the village named C. Bellemore died last night, and Mrs. C. died to-day. Both are being buried to-day with the greatest possible care to prevent any infection from them.

Mrs. C., I understand, was suffering from giving birth to a child prematurely a few days since, and this, with the small-pox, was the cause of her death. Dr. Tracy, of Escanaba, was attending Mrs. C., besides our regular township physician, Dr. Girard.

No new cases later than those above mentioned in the township. All other cases in the township getting along nicely, except Lafere, who was very weak from consumption before taking the small-pox, and who will probably have a hard time of it.

On March 7 Mr. Hoggerson reported as follows:—

Since my letter to you of March 3 we have had two deaths in the township from small-pox: One Henry Lafere, the man that I wrote you had consumption before taking the small-pox, died Sunday morning and was buried Sunday night, and the other, a child of Frank Beaudets, died last Friday and was buried Friday night. We have had no new cases in the township within the past ten days.

At the Indian settlement there are 11 Indians sick with the disease yet, but they are all improving. There have been no deaths among the Indians during the past 2 or 3 weeks.

On March 10 Mr. Hoggerson reported that the disease was thought to be under control, as follows:—

Your letters of the 6th and 7th insts. are at hand. There has been no further spread of small-pox in this township since I wrote you last, and I think we have it fully under control. I do not think, as things now look, that it is necessary for you to send any person here to help suppress the disease. If it starts breaking out again in any unexpected quarter I shall notify you immediately.

Dr. Rosenberry, of Menominee, went through this township from one end to the other and vaccinated every person in the township with virus points, from Dr. Griffin's vaccine farm, at Fond du Lac, Wis. The vaccination did not take very well at first, and we re-vaccinated with other points, fresh from Fond du Lac, and with points from the Chicago vaccine farm, and also in a good many instances from arm to arm. In a great many instances persons were vaccinated 5 to 10 times with the Fond du Lac points before taking, and they would then take and work good.

On March 15 Mr. Hoggerson wrote that two deaths had occurred, but there were no new cases, and that all the old cases were getting along nicely. In making a resumé of these cases it is impossible to give the total number of cases or deaths. From Mr. Hoggerson's letter it appears there were 30 deaths, principally among the Indians.

On March 9 Dr. W. W. Mulliken, of Escanaba, reported that he had treated three cases of small-pox at Ferry, three miles from Spalding.

MONROE COUNTY.

In January small-pox was reported to be present in a family near Monroe where the father (who had the disease), had recently returned from Chicago. On Jan. 16 Dr. P. S. Root reported the gentleman's son as being sick with small-pox. These two cases were closely quarantined in their residence which was conveniently located for it, and the disease did not spread.

MONTCALM COUNTY.

Dr. D. A. McLean, health officer of Stanton City, reported one case of small-pox as follows, dated Feb. 20, 1882:

Your communication in reference to small-pox received and I employ my earliest convenience to reply. The source of the disease was probably either Pittsburg or Fort Wayne, the man having left the former place some 17 or 18 days before, and passed through the latter, stopping several days. He was taken sick the second day after his arrival with what proved to be the confluent form of small-pox. The case progressed favorably until the ninth day when he was taken with violent delirium which steadily grew worse for about 20 hours, when coma supervened and death shortly afterwards, the man dying, in my judgment, of meningitis. As soon as the character of the disease was positively diagnosed a meeting of the board of health was called and energetic measures taken to arrest its spread. The house where it occurred being somewhat separated from others it was quarantined and the patients kept there. I had already vaccinated the remainder of the family before calling the board together, and I was instructed to vaccinate the entire city, which duty is now nearly accomplished. No further cases have as yet appeared and I am encouraged to believe there will be none outside of the family, and perhaps not even there as the vaccination is working well with all of them. There has been no such exposure to the disease as some of the sensational newspaper reports make it appear. The only reverse which the board of health has met with was in the matter of burial. All arrangements for an immediate burial were made by myself, but after I had gone home and retired (being sick with my own vaccination), the parties engaged to do the work backed out, and it was found impossible to procure others that night. The house and surroundings have been thoroughly disinfected, and in short everything that could be done to stamp out the disease, with good prospects of success. Should any other cases occur will notify you of particulars.

Dr. McLean reported, March 9, the subsidence of the outbreak, there having been but one case other than the original case. He also spoke of the severity of the vaccinal sores:—

I have the pleasure to report to you that there has been no further spread of small-pox in this city, and that we now consider ourselves free from any danger from that source of contagion. The second case was varioloid of a mild character, no marks being left. No more perfect illustration, on a small scale, of the value of vaccination in heading off small-pox could be desired. Every one of the family on whom the virus took effect escaped entirely. With the one who had the mild form of the disease the vaccination was delayed in its working for a week, but the areola had commenced to appear before the initiatory fever of the disease appeared. Please inform me what you know in reference to the violent action of vaccine virus this year, as compared with other years, and if you have known of such violent action, your idea of causes of same, means of avoidance, etc. It has been very severe here and in neighboring towns, with virus obtained from different places. I have to-day seen a case at Sheridan, six miles south of here, that bids fair to terminate in death, and as near as I can learn from the doctor in attendance, there has been no true vaccine vesicle formed, but only a suppurating sore, with erysipelatous inflammation. Such cases tend to very strongly prejudice the public against vaccination, and bring it into disgrace.

Dr. McLean wrote on March 13, in reply to a letter relative to the case of severe sickness from vaccination at Sheridan, as follows:—

In answer to your question as to the source of virus in Sheridan case, would reply that I believe it to have been from Cleveland. All the virus that I have used this season, about 1,500 points, has come from the Northwestern Vaccine Company, Fond Du Lac, Wis. There have been a great many severe cases, a considerable percentage of which I do not believe to be true vaccine sores, but only septic sores, and of course giving no protection against small-pox. There have also been some other singular if not suspicious effects from vaccination. In a number of cases a distinct papular eruption has appeared, entirely different from the erythema which frequently occurs. The papulæ, which are quite small, pass through the various stages of the small-pox eruption, a vesicle forming on its apex, passing into the suppurative stage, and then drying up and dropping off. Only a small number of the papulæ formed pass through these stages, the most of them disappearing without maturing. The time required to complete the several stages is about a week. So far

as I know no case has proved to be contagious unless it be one now under observation. About three weeks ago a woman and her two children, aged about five and seven, were vaccinated. The virus took effect on but one of the three, the oldest boy, but in three or four days the other child broke out with the eruption I have described but was not sick enough to be confined to the bed. The arm did not get sore. In 10 or 12 days after, that is about four days ago, the mother came down with the same eruption with considerable headache, backache, fever, etc., and is quite sick, although not seriously, The eruption is all over her body, but distinctly papular. Probably one in five or six has a vesicle on it's apex. They also appear on the mucous membrane of the mouth. The woman has never been previously vaccinated. Now the questions that I am called upon to decide are: Has the woman varioloid? If so where did she get it, there being no known source of contagion? Could the virus introduced into the child's arm have been something more than vaccine virus and given rise to the eruption and the mother contracted it from him? Is the disease that the woman has contagious and ought she to be quarantined? I was called upon yesterday as health officer to see the case and decide its character, and confess myself as considerably puzzled, but took the precaution to quarantine the house for a short time. In talking with Dr. Ranney, of Lansing, on this subject a short time ago before the occurrence of this case, he suggested the possibility that the virus I was using might have been produced by inoculating the heifer with small-pox virus and charging the points with the virus thus obtained. Would virus of that character only one remove from the small-pox vesicle, be more active and virulent, and might it give rise to the eruption spoken of, in your opinion? If so is there any danger of its being contagious?

J. H. Dumon, M. D., health officer of Crystal township, Montcalm county, reported on August 1, a case of small-pox which came from near Portland, Ionia county,* and gave the disease to three other persons in the same family.

NEWAYGO COUNTY.

Dr. D. W. Flora, of Newaygo, wrote the following letter Feb. 6, 1882:—

I take this first opportunity to notify you that small-pox has appeared in this county. Last week one Frank Warren, of White Cloud, was sick with some mild disease. Small-pox was not thought of until his brother and brother's wife came down with a disease, which is now declared small-pox. The first was a mild varioloid. I have not yet seen the cases, and many wild rumors are flying. In some cases the number affected has been reported as high as seven. In addition to the above a barber is said to be taken down with it. Will send you news of further developments.

Dr. H. T. Reed, health officer of White Cloud village, reported the above cases on Feb. 2, as follows:—

We have three cases of small-pox here. We are keeping them all at one house, and doing every thing we can to stamp out the disease. Received the circulars, and will distribute them to the best advantage. I will give a full report of the cases as soon as possible.

On Feb. 28 Dr. Reed wrote that they had restricted the disease successfully, but one case having occurred other than the four original cases, and that case was a nurse who was well protected by vaccination, and had modified small-pox. He could not determine what was the source of the contagium.

Dr. R. S. Trask having been elected health officer of White Cloud village, reported 3 new cases of small-pox May 22, and 4 cases June 22, giving no source of contagium.

Dr. H. T. Reed reported on March 28, six cases with one death in Everett township, Newaygo county. Of these cases J. M. Grovensteen, health officer, reported on April 28 as follows:

The source is not known in my town. It was supposed to be chicken-pox for two weeks, and the neighbors were in and out until I sent a physician to investigate the matter. He pronounced it small-pox. Then I stopped all communication from outside except the regular attendants. Since then there has been two more families that have had it. There have been 16 cases and five deaths.

I have had good success in it. There has been one exposed since the disease was known. We have got it stopped. I think all that were exposed have got it now, and are getting along well.

Wm. S. Utley, clerk of the board of health of Big Prairie, reported on April 26, three cases of small-pox and one death, as follows:—

We had three cases of small-pox in this town, and one person, Mrs. Elsie Sutherland, died. The other two are nearly well, will be out in a week; Mr. D. V. Sutherland, the husband of Elsie, and

* An account of small-pox in Ionia county may be found on pages 404-7 of this Report.

their child, Sherman, nearly three years old. We knew that they would have it, had a good nurse at hand, guarded the house properly, and it has not and will not spread. The town had been to the expense of vaccinating every body some weeks before, and if Mrs. Sutherland had staid at home as she should. and had not run right into it in defiance of her neighbors and her husband, she would have to-day been alive and well to take care of her little one that is now left motherless. Hers is a case akin to suicide.

OAKLAND COUNTY.

Dr. C. G. Davis, health officer of Milford village, reported the introduction of small-pox into that village as follows:—

A man whose family lived in the rear end of a millinery store came home from Colorado something over a month ago, and soon after was taken sick from the effects of vaccination which had been performed in Denver. He said that he had not been exposed to small-pox, and as he had been a man of rather loose morals I supposed he had some impurities in his blood that did not belong there. I supposed that to be the real cause of his sickness, together with the vaccination. At any rate I did not think he had varioloid at the time, but think so now, or else he brought it in his clothes, which is probably the correct theory of the matter. About two weeks afterwards his oldest girl, ten years old, had chicken-pox very bad, or what was called that; at any rate she has no pits on her face now after getting over it, was only sick a few days, and had never been vaccinated, and about a week ago his youngest girl (eight years), came down with the same, they said.

Also, a week ago to-morrow a young man who boarded there and who tended bar in a saloon was taken sick in the saloon, and people said he looked like small-pox. On Saturday I saw him, and it proved to be small-pox, as also the youngest girl. The man's mother who came home from the west is a spiritualist doctress, and treated the little girl, and it was kept covered up until after I saw the young man. The old lady also took varioloid; had some grand-children at her house, one of which is down with small-pox and more to have it. It was all kept dark until I went there last Monday and found them sick with it. They allowed people to come there, but not into the room where they were. A good many have been at both places, but it is not time yet for them to come down. We have three cases of small-pox and three of varioloid. No deaths. I have quarantined both places, and think it will not spread, unless some of those who have been exposed come down with it. Have built a pest-house ready for new cases if they should occur.

All physicians here have been vaccinating at village expense ever since. I vaccinated about 80 last Sunday. It is being pretty thoroughly done.

Dr. Wm. McCarroll, health officer of Pontiac, reported on May 24 as follows, concerning a case where doubt existed as to the true nature of the disease, but where all restrictive measures were taken the same as would have been if the case had been well marked small-pox, which action was very praiseworthy:—

On May 8 a suspicious case of an exanthem was reported to the health officer for investigation. I at once made a personal examination and diagnosed a case of measles, but as I am a new beginner in practice and had never seen any cases of variola, I called in three of our town physicians and they considered the case one of variola modified by vaccination. Considering their opinion entitled to more weight than my own I at once isolated all exposed parties, placarded the house in which the patient was, vaccinated all unprotected by recent vaccination, and at night had case taken to pest-house. No other cases have occurred, and as sufficient time has elapsed I am not at all anxious that anything will come of this case. The person under consideration at time of my first seeing him had a very prominent papular eruption occurring over the greater part of his body, attended with considerable pyrexia, quite violent bronchitis and coryza. The second day showed decided amelioration of all the symptoms, none of the papules went to pustulation, and in four or five days no evidence of any eruptive disease could be observed. The patient was a negro, had been at Chicago a couple of weeks previous to his coming under observation. In this case I had at all times considerable doubt as to the diagnosis, but adopted the safe course under the circumstances, and we are now entirely free from the disease.

On June 7 Dr. McCarroll reported three cases of supposed varioloid as follows:—

I have to report three cases of varioloid occurring in my jurisdiction. On Wednesday the 31st ult. a case of varioloid was diagnosed. I investigated and concurred in the diagnosis, and as the party was living in a house quite a distance from any others I had the case quarantined at home and interdicted all communication with the family. Case occurs in a child nine years old, vaccinated a little more than a year ago, but not a very good "take." I tried to connect the case with the case on May 9, but could not trace any connection, and although I have followed up a good many clues have not been able to as yet find any possible source of contagion. On Saturday last, June 3, two more

cases of varioloid were reported, occurring in the persons of two little girls, sisters, both successfully vaccinated last year. I here was not able to concur in the disagnosis and so had my predecessor in office, Dr. Elliot, see the cases, when he concurred in the diagnosis of varioloid. These cases were then at once isolated and all precautions taken for the spreading of the trouble. The latter cases have not been sick enough to need medical attention, and I look upon them as cases of varicella, but concluded to act on the opinion of the old and experienced physicians. In these cases also it is not yet ascertained whence the disease came and we are at a loss to ascertain the probable source. We are having now some cases of varicella in town, and children from homes in which the disease has been have been in the same school with the children in whom the reported varioloid exists.

OSCEOLA COUNTY.

On March 29, 1882, the mail steamship Cimbria left Hamburg. Hermann Gesa left Hamburg, as near as can be ascertained from him, at that time and on that vessel. There was a case of small-pox on board the Cimbria on that trip which the surgeon reported,—a child, who was noticed to be sick on the evening of April 3, and was put in hospital on the following day, and carefully [?] isolated, the eruption appearing the next day, which was April 5, 1882. Mr. Gesa was vaccinated when a child, and he was also vaccinated on the ship. The ship's surgeon says he examined each passenger with reference to their protection from small-pox, and vaccinated those whom he thought were not completely protected. At New York quarantine they were again examined and 215 vaccinated. Dr. E. S. Richardson, of Reed City, who interviewed Mr. Gesa, says of his vaccination and of his introducing small-pox into Reed City as follows:—

The scar from the vaccination when a child presents the pock marks characteristic of good and effectual vaccination, while that done on the ship is spurious, there being no indentations or pock-marks. After arriving in New York he left the ship in about two hours. About three weeks after he left the ship he had small-pox, here in Reed City. Four weeks after, his sister-in-law, Mrs. Mesky, became sick with small-pox, and her baby six months old had small-pox and died. Gesa was living in the house with Mesky at the time. No physicians saw the cases here. They were living in an isolated place, and only a few Germans knew of their sickness. They knew at the time that it was small-pox. Philip Barth worked at hanging a door for Mesky, and Gesa held the door up for him. Gesa's face at the time was broken out with small-pox.

Although the period of incubation (three weeks) is long for small-pox, it is believed he contracted the disease on ship-board or that the contagium was lodged in his clothing or baggage. It is more easily believed that he did contract the disease on ship-board because one other passenger (Bettit)* is known to have contracted it on board the Cimbria on this same voyage. The man Philip Barth contracted the disease on the day he hung a door for Mesky, and in which operation he was assisted by Gesa. Barth then went to Westwood, Kalkaska Co., to work, and was taken sick there and distributed the disease widely in that locality.†

OTTAWA COUNTY.

Dr. J. H. Ginley reported on June 22, 1882, one case of small-pox in Polkton, Ottawa Co., in a girl 15 years of age, source of contagion not known. Precautions were taken to prevent its spread.

SAGINAW COUNTY.

Dr. Samuel Kitchen, health officer of East Saginaw, reported small-pox in Saginaw as follows on May 18, 1882:—

Dr. L. states that on Sunday, April 16, 1882, he was called to attend one John Stough, who was door-keeper in the passenger depot of the F. & P. M. R. R., in this city; said that he was suffering from fever, great pain in the head, etc. He treated him for two or three days, when an eruption appeared. The doctor had a suspicion that it might be small-pox, but as it did not have but

* An account of small-pox in Saginaw Co., introduced by passengers from the Cimbria, may be found on pages 425-7.
† An account of small-pox in Kalkaska Co., introduced by Barth, may be found on pages 408-11.

few of the characteristics of small-pox, the man stating that he had had an eruption on his lower extremities for the last two weeks, of the same character, he did not feel sure about it. Stough at the time was expectorating prune-juice fluid, and his urine was the same color.

The doctor called the then health officer, Dr. C. of this city, who was not certain as to the disease; they both called in Dr. E., who was attending a patient in the next house, who also was not sure what the case was, but was so suspicious of it that he changed his clothes before visiting any of his patients further. The neighbors were allowed to visit and nurse Stough, and several were with him when he died, which was on the night of the 24th of April. There was doubt about taking his body to Clare (a station on the F. & P. M. R. R.), but the health officer and Dr. L. both gave a certificate to the railroad authorities that the disease was not contagious, and on that assurance the body was taken on the cars to Clare on the 25th or 26th of April. The railroad people were not completely assured of the non-contagiousness of the body, and took the precaution to carry it in an empty box-car, and not in the baggage-car.

On Wednesday, the 3d of May, I was called to attend the two children of Stough, in the same house. They were not much sick, and upon the assurance of the mother, that none of the neighbors came to her house, I did not isolate them immediately, but waited further developments. On Thursday there was a slight eruption on the boy, aged 7 years, none on the girl. I was then quite sure that the disease was small-pox, but in order to be more certain I asked Dr. B. B. Ross, who had large experience here in 1873, to see them, which he did, and unhesitatingly called it small-pox. Friday the girl, aged 16 years, had an eruption. These children had never been vaccinated, (the mother had been well vaccinated). On the same day, Thursday, a young man who helped nurse Stough, was taken sick at the Kirby house, Saginaw City, and under the light we then had he was immediately taken to the pest-house.

On Monday, the 8th of May, Peter Naudescher, who was with Stough on the night he died, the night of the 24th of April, and who played the part of amateur undertaker, was taken sick and sent to the pest-house in this city, where he now is confined with a bad case of varioloid.

The girl, Johanna Stough, died on the 11th of May. All precautions have been taken to stop the disease where it is, and prevent further spread of it since we were sure we had it. The certificate given by the health officer, and Dr. L., as the attending physician, was that the man died of "*purpura haemorrhagica exanthematica*," when he certainly died of variola purpura, or hemorrhagic small-pox.

From this center so far have developed four cases, viz.: Young Seymour, P. Naudescher, James and Johanna Stough—two variola and one varioloid, with one death, besides the death of the first case.

Dr. Kitchen reported a second outbreak of small-pox which, by means of correspondence from him and the health officer of the port of New York City, was traced to its origin as follows:—

Two Germans (Bettit and Barends) left Hamburg on the steamship Cimbria,* March 29, 1882, arriving at quarantine, New York, April 12, at which place the health officer of the port found on board one case of small-pox. The ship's surgeon reported that the child was noticed to be sick on the evening of April 3, and was put in hospital on the following day, and carefully isolated, the eruption appearing the next day (April 5). These two Germans came to a place near East Saginaw, Michigan, arriving there April 15. On April 19 Mrs. Wittmes, a sister of Bettit, washed his clothes, and the clothing of Barends was washed by Mrs. Shultz. On April 23, Bettit was taken sick with varioloid, and on May 4 or 5 Mrs. Wittmes came down with the disease. Mrs. Barth, in whose house Mrs. Wittmes was staying, came down with the disease on May 3 and died May 14. On April 29 or 30, before she was taken sick, Mrs Wittmes moved from the house of Mrs. Barth into the house of Mr. Grabuskie, in the township of Buena Vista, and both Mr. and Mrs. Grabuskie had varioloid, also Mrs. Wittmes' child, who was taken May 20. Barends says he heard some talk on board ship about small-pox, and that a body, which may have been that of a man, but thinks it was a little girl, was buried at sea two days before reaching New York. The ship's surgeon says that but one death occurred on board, and that was an old man (aged 65) who died of "debility." The surgeon says he examined each passenger with reference to their protection from small-pox, and vaccinated those whom he thought not sufficiently protected. At quarantine they were again examined and 215 vaccinated. Neither Bettit nor Barends were vaccinated on board ship or at New York quarantine. The German (Bettit) who came over in the Cimbria, had varioloid, which shows that he was *not* completely protected, yet he was not vaccinated either by the ship's surgeon or at New York quarantine. If he had been, it is possible that this outbreak of small-pox near East Saginaw might have been prevented. This is not certain, however, because it may have been that Mrs. Barth and Mrs. Wittmes took the disease from the clothing of the Germans, which was washed by one of them. Mrs. Barth (taken sick on May 3) probably contracted the disease about April 22, or about the time Bettit was taken sick. If these women took the disease from the clothing of Bettit and Barends, then it may have been that the little girl

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* An account of another outbreak of small-pox, introduced, as is believed, by a passenger on the Cimbria on this same voyage, may be found on page 425.

sick with small-pox on the Cimbria, was not as carefully isolated as she ought to have been, and that the clothing, baggage, etc., of the passengers of the Cimbria should have been disinfected at New York quarantine. If the women contracted the disease from Bettit, he probably contracted it on shipboard, just before or about the time of landing at New York, and this would tend to show that the child was not as carefully isolated as she ought to have been.

In this outbreak near East Saginaw there were six cases and one death.

A friend from Saginaw City watched during the sickness of one of the cases in East Saginaw, and on May 10 Dr. I. N. Smith, health officer of Saginaw City, reported him sick with small-pox at the hospital at Saginaw.

SANILAC COUNTY.

Dr. L. C. Read, health officer of Watertown township, Sanilac Co., reported one fatal case of small-pox on Feb. 11, 1882. The body was quickly buried, clothing burned, and disinfection thoroughly practiced.

ST. CLAIR COUNTY.

John L. Newell, health officer of Port Huron township, reported on Feb. 5, 1882, small-pox in his township brought from Chicago, as follows:—

In reply to yours of the 2d will say that small-pox is present in the township of Port Huron. A Mrs. Carll came from Chicago to visit the Burke family and transmitted the disease to a female child of Patrick Burke aged six years. Taken sick about the 8th and died on the 12th of January. It was thought to be a case of measles, but the family were warned not to have a public funeral in case it might be something more dangerous. There was a funeral at night and I believe there was what is termed an Irish wake. Not many days elapsed when Patrick Burke's little boy was taken sick. A doctor from the city of Port Huron was called and pronounced it small-pox and notified the board of health. The board immediately convened, the infected family was isolated, and a signboard (small-pox) placed on the premises. We soon discovered that persons who attended the funeral were sick, although they would not admit they had the small-pox. We isolated every family who had been exposed and now have the disease strictly confined to four dwelling-houses, all situated on a road named the wooden track. The following are the cases that have occurred in each infected dwelling-house:

Dwelling-house of Patrick Burke, female child six years old, died; male child, recovered; infant, doing well, very light.

Dwelling-house of Thomas Aistrop, Mrs. Aistrop, recovered; Thomas Aistrop, recovering; adopted daughter, just taken down.

Dwelling house of John Dunnovan, Mrs. Dunnovan, recovered.

Dwelling-house of Jos. Bairden, Christopher Bairden, died, aged 29 years.

All the physicians in the city of Port Huron refused to attend the patients. The township of Port Huron has no resident physician. We finally secured the services of Dr. McLaren, of Smith's Creek, township of Kimball, to attend them through their sickness. Vaccination has been going on at a very rapid rate for the past two weeks and the city doctors are reaping a rich harvest. Some charge fifty cents and others one dollar each. We burn sulphur to disinfect and will supply them with sulphate of zinc for washing purposes. The documents you sent I distributed where most needed. Please accept thanks.

I forgot to state that I am informed that the Mrs. Carll referred to in the fore part of my letter did have a slight form of the disease when she came to Mr. Burke's, but was very indignant when accused of it and did not seem aware of the danger.

There is another case on the same wooden track in the township of Kimball at a house, of the name of Cooleys. I believe they attended the night funeral before mentioned. They are isolated by the Kimball authorities. When all is over I will send you a more definite report of all the cases. The annoyance, care, and anxiety attendant upon the office in this township is very great. I get plenty of abuse, very little appreciation of services, and expect no pay.

Chas. A. Bailey, clerk of township board of health of Port Huron, reported on May 27, a case of small-pox in one of the families where it existed the winter before.

Dr. A. D. McLaren, health officer of Kimball township, reported one case in his township, on Jan. 31, 1882. Dr. Kimball said he had vaccinated and revaccinated over 300 persons. Dr. McLaren also reported four cases in the township of St. Clair. On Feb. 7, Dr. McLaren reported four new cases in Kimball township, in the same family as the first case. Dr. McLaren contracted varioloid himself, being recovered by Feb. 22, but he remained in

quarantine until March 2. On March 24 he reported a new case in Kimball township, in a man who had assisted in caring for the first family taken. The man had had varioloid in Scotland when he was 10 years old.

Dr. H. R. Mills, supervising sanitary inspector for the National Board of Health, at Port Huron, reported on May 26 a case of small-pox on an immigrant train which passed through Port Huron on the Chicago & Grand Trunk R. R. Not having at that time any authority to remove the case from the train, notice of the approach of the case was sent by telegraph to the health officer of Chicago. Dr. Mills also found, and the local health officer removed from the train, the family of immigrants mentioned in the next paragraph.

Dr. D. M. Bennett, health officer of Port Huron, reported a case of small-pox on June 9, 1882. It was an immigrant Polish child, aged five years. The child came over from Bremen on the steamship Brunswick, arriving at New York May 26. The mother of the child says it was taken sick on ship-board, one week before reaching New York, and that it was broken out before reaching there. She also says they were vaccinated on the ship, but the health officer at Port Huron could see no evidence of such vaccination. She says they were not examined at New York. They were only two days from New York to Port Huron, and the child had been "broken out at least a week." The remaining members of the family, consisting of the mother and two children, had had small-pox in the old country an unknown time before.

ST. JOSEPH COUNTY.

Dr. G. W. Nihart, health officer of Park township, St. Joseph Co., reported on Feb. 2, 1882, a case of varioloid in a young man who had been nursing cases of small-pox at Leesburg, Kalamazoo Co. An account of small-pox at that place may be seen on page 407. When he began to feel ill he gave the authorities at Leesburg the slip, and came to his brother's house in Park township. He claimed to have had the disease when he was 14 years old, and did not think he was sick with it again. Seven members of his brother's family were exposed, but were promptly vaccinated. On Feb. 15, Dr. Nihart reported the above case discharged. On Feb. 23, he wrote:—

The latter part of last week three more came down with small-pox. The man of the house, his youngest child, and grandmother. Mr. P. has the discrete, and the others a very slight attack of the varioloid. Mr. P. is quite full, especially on the face. The vesicles are about ready to suppurate. He was doing nicely yesterday. Would there be any danger in their writing letters (those of the family who are not down), and sending same through the mails?

To his question as to writing letters a reply was made that there was danger unless the letters were thoroughly disinfected. On Feb. 28 Dr. Nihart wrote:—

Your card of the 25th inst. at hand. I am fully aware that there is danger in allowing small-pox patients to write and send letters through the mail, but the purport of my interrogatory was with regard to those who had convalesced, and members of family who were not afflicted. My opinion is that with proper precautions there would be no danger; am not allowing it, however, but as the family pressed the matter, concluded to ask your opinion. No more are down. Patients are convalescing.

TUSCOLA COUNTY.

Dr. N. L. McLachlan, health officer of Elkland township, Tuscola Co., reported as follows on Feb. 3, 1882:—

Small-pox has broken out in this township. Parties from here had been through Chicago, Ill., about two weeks ago last Saturday. One of them, a boy about ten years old, became sick. I went to see the case this morning to verify the diagnosis, in regard to which there had been some doubt. I found the boy in the eruptive stage of semi-confluous variety I should judge. We have established a quarantine and the board have ordered a general vaccination. I telegraphed to-day to Detroit for points. If you can give us any suggestions we would be pleased to receive them.

VAN BUREN COUNTY.

Dr. J. Camp, health officer of Bangor, wrote on May 8, 1882, reporting two cases of varioloid which were closely quarantined and no more cases occurred. The source of contagion is somewhat uncertain. Dr. Camp vaccinated a Mr. Lee, his wife, and five children. Mr. Lee had quite an extensive rash covering nearly his whole body. The vaccination in the arm worked the same as in the remaining members of the family. Dr. Camp was called to look at Mr. Lee and found a daughter and her babe who had come home the day before.

The daughter refused to be vaccinated, or to allow the baby to be. Ten days after, both had varioloid. It is a question whether Mr. Lee had been previously exposed to small-pox, and his vaccination modified the disease, and he having varioloid communicated it to his daughter and her babe, or whether Mr. Lee had varioloid at all, his rash being the somewhat common effect of vaccination, and the daughter and babe were exposed before coming to Mr. Lee's.

V. Bennett, health officer of Geneva township, Van Buren county, reported on Jan. 16, 1882, cases of small-pox supposed to have been contracted in Chicago, as follows:—

On Jan. 3 I was called to see a sick child that had been sick 4 or 5 days, a daughter of Milton Maybee. I pronounced it small-pox at once, in its worst form. By inquiries I found that Milton Maybee and J. N. Maybee both came from Chicago about five weeks before. Said they saw no small-pox; did not know they had been exposed. Mrs. Maybee washed their clothing. Ten or twelve days after she was taken down with high fever, pain in head and back, flushed skin, and, as she said, "had a little breaking out," but was not sick enough to call a physician. She was vaccinated when young. I thought it was a mild form of varioloid. About 10 days later the child was taken down. The following week I was called, as above stated. The child, 4 or five years old died on Jan. 4, 1882. The younger child, 2 or 3 years old, was taken sick on Dec. 27, with pure small-pox, is recovering.

J. N. Maybee was taken sick about the 3d, was vaccinated over 20 years ago, had mild form of varioloid. Al. Maybee (brother) was vaccinated for the first time the 5th of this month. Worked well, lives in the family, has mild form of varioloid. All doing well. Mrs D. C. Bennett, mother of Mrs. M. Maybee and M. Maybee, both vaccinated when young, have taken the whole care of the family. Show no signs of varioloid as yet.

All precautions have been taken by the board of health, to control the spread of the disease, that they thought necessary. A few persons were exposed previous to Jan. 3.

Complaints had been received at this office that the board of health of Geneva township was not doing its duty, and the clerk of the board of health having been written to concerning the complaints, sent the following relative to action taken by the board:—

The board of health of the township of Geneva met on Friday, the 30th day of December, 1881, for the purpose of taking action in regard to a case of small-pox reported by the health physician of the township of Geneva. A resolution was adopted empowering the health officer to obtain reliable bovine vaccine virus and vaccinate all the people of said township who desire it at the expense of the township of Geneva. A resolution was adopted directing the health physician to give notice to the several school districts of the time when he will meet at their school-houses for free vaccination, and to do this at his earliest convenience. The following resolution was adopted, viz.:

Resolved, That the health physician is hereby empowered to take all needful action in regard to the care and isolation of all persons in said township who are sick and infected, or who may hereafter be sick or infected with small-pox.

Given under our hands this 30th day of December, 1881. GOODWIN S. TOLLES,
CLARK PIERCE,
GEO. H. REEVE, *Clerk*. FRANCIS R. CADY,

Two other cases in the same family came from the four above mentioned, making six cases and one death. On April 1, Dr. Bennett reported a fresh importation of small-pox from Chicago, as follows:—

A Mrs. Thos. Thorsten, daughter of Israel Siboli, had been living in Chicago, had lost a child

there with small-pox. Soon after the child was buried they came home to her father's in this township. She was quite sick when she came. A doctor was called who in pronounced it small-pox. The board of health met at once. I was notified of the meeting but was very sick at the time. The board appointed F. R. Cady, justice of the peace, assistant health officer, who reported to me every few days. The roads were fenced up and all precautions taken that they thought necessary to prevent its spread. The case has nearly recovered. On March 30 I received a report that Andrew Miner, another son-in-law of Mr. Siboli, was taken with all the symptoms of small-pox. He has not been vaccinated. To-day, April 1st, I received a report that Thos. Thorsten, husband of the sick woman, packed up his things, went to Breedsville, six miles, and took the train for Chicago. The board of health knows nothing of this move. The board hired Mr. James Greenman, who had had small-pox, to try to keep them under control. He stays nights with them.

Dr. H. C. Maynard, health officer of Hartford township, reported on Nov. 28, 1881, two cases of small-pox with a certainty of 5 or 6 more, but did not think it would spread beyond that number, as he had established a rigid quarantine. On Dec. 2, he reported that he had 3 cases of confluent small-pox and 4 cases of varioloid. The source of contagion in this outbreak is not given.

WAYNE COUNTY.

From the first annual report of the board of health of the city of Detroit, issued in July, 1882, I find there were from Oct. 1, 1881, to June 15, 1882, 42 cases of small-pox and varioloid, and 12 deaths; the history of each case is briefly given in the report by Dr. Wight, the health officer. The supposed sources of introduction may be summarized as follows: From Chicago, 4 outbreaks; from Illinois, 1 outbreak; from the country, exact place not known, 2 outbreaks; from visiting immigrants as they passed through the city, 1 outbreak; from a tramp, 1 outbreak; three individual cases were tramps, one case was in a newly arrived immigrant; and one case was a girl who had been away at service; one outbreak was probably due to handling a dog from an infected house; two had just arrived from Canada; one outbreak of two cases was probably due to a man just arrived from Cincinnati, where he had had varioloid recently; one outbreak was supposed to be due to an itinerant salesman; two outbreaks were probably due to travelers stopping at hotels; one could not be traced, and in 4 cases it was not given. One case was sick Oct. 1 when Dr. Wight took charge of the health office. In one case the origin could not be traced.

Small-pox was present in Detroit from June 15, which time the foregoing summary ends, to July 29, 1882, there being ten cases, as reported by the health officer, but no cases were reported to this office as having occurred between Aug. 12 and Sept. 30, the time of ending this article.

In the First Annual Report of the Board of Health of the city of Detroit, the present mode of dealing with small-pox in that city is stated by O. W. Wight, M. D., health officer, as follows:—

"Vaccination, isolation, and disinfection are the means upon which sanitarians must rely in combating this most dreaded of all diseases. The methods of using these preventives are of great importance. Not only diligence is required, but also accurate knowledge of the natural history, thus to speak, of this loathsome malady. Certain enumerated facts concerning it may be given to facilitate reference.

"1. As a rule, small-pox manifests itself on the twelfth day, or thirteen times twenty-four hours, after infection. The most obvious subjective symptoms are fever, headache, backache (spine-ache), and nausea. Two days afterwards, or thirteen [fifteen(?)] times twenty-four hours after taking the disease, eruption appears, at first in bright red pimples, with a hard shot-like base, which in due time develop into vesicles, at first rounded, then depressed or umbilicated, afterwards into pustules, which finally become scabs and fall off, leaving pock-marks. The object here is not to describe the disease from a medical point of view, but to indicate certain land-marks, from a sanitary point of view.

"2. The best pathologists regard small-pox as not contagious during the first two days of fever headache, backache and nausea. Dr. Alonzo Clark, of New York, and there is no higher authority in this country, says the disease does not become contagious till the eruption passes into the

umbilicated vesicular stage. This is the precious period during which the sanitarian may get in his preventive work. The symptoms during the two or three days of primary fever and first papular eruption are striking enough to put the properly educated and wary medical attendant on his guard, and he should lose no time in communicating his suspicions to the health authority, whose duty it is to protect the public. The victim of the disease may then be isolated without endangering even the members of the same family. The patient may be removed to the proper hospital, and the household may go out in safety, or members of the family may be removed to some other place, leaving patient and attendants in possession of the house.

"3. The eleven days of incubation afford a precious period for the observation of those who have been exposed, and to make preparations for their care if they should be overtaken by the malady. During that period they are perfectly safe to others, and may be allowed to come and go at will.* As the time of probation draws near its close they should report to the health officer, or be visited by him, for the purpose of observing the first symptoms of the disease. Such suspects should be treated with the greatest kindness and sympathy, while strict obedience must be required of them for the good of others. I have had no trouble in dealing with such, and have made them feel that the health authority, while necessarily inflexible, is their best and most helpful friend. Cases of noble self-sacrifice have been met with, worthy of enduring record. A wrestle with loathsome pestilence, during which the light of life may be extinguished, and the final resting-place be reached in the solitude of night, without the presence of mourning friends, is not pleasant to contemplate, and can be fully appreciated only by those who have looked the situation in the face.

"4. Vaccination, always an armed friend against the dangerous foe, is especially precious in the hour of exposure. Well performed, with reliable virus, it will overtake small-pox and at least modify it into varioloid, when resorted to within three days after infection. It is the sling of David with which the giant may be slain. * * * * * * The arguments in favor of vaccination cannot be too often reproduced."

"* * * * * Of course cases [of small-pox] must be reported to the sanitary authority as soon as suspected. Isolation is of great value. A large card on a house, announcing that the disease is within is very effective, for the simple reason that everybody is afraid of small-pox, and will avoid it when its location is known. Intelligent, thorough, painstaking disinfection of the place after the disease is essential."

Wm. A. McFarlane, health officer of Greenfield township, Wayne county, reported July 23, 1882, small-pox in his township, brought from Detroit, as follows:—

In regard to the recent outbreak of small-pox in my township, I wish to say it was confined to a house occupied by prostitutes, near the suburbs of Detroit. The occupants of the house consisted one man, who came there from Detroit, and was sent to the Detroit pest-house by health officer Wight, two women, one of whom had the small-pox, and one small boy, which I sent to the Wayne county pest-house. Their goods were inventoried, and it was found cheaper to destroy than to disinfect them. The dwelling they occupied was, by consent of the owner, burned, together with household goods, dogs, cats, and everything belonging to the crew. The patients are all doing well, and no other cases that I know of in the township.

WEXFORD COUNTY.

Dr. I. N. Coleman, health officer of Cadillac, reported on June 3, 1882, two cases of small-pox, the source of contagion being unknown. The cases were immediately quarantined and a competent nurse hired; a hospital was built and the patients removed thereto. The premises where the disease first appeared were thoroughly cleaned and disinfected, and no further cases were reported.

The efforts to restrict the 100 and more outbreaks of small-pox occurring during the year, involved a large amount of labor on the part of the State Board of Health, as well as by the local boards of health.† Judging from

*[However this may be, there is still the possibility that the contagium may be attached to their persons or clothing so as to be disseminated.—H. B. B., Sec. S. B. of H.]

† The document issued by the State Board of Health on the Prevention and Restriction of Small-pox, has been translated into the German language, and copies in the English or in the German language may be obtained of the Secretary of the State Board of Health, Lansing, Mich. Copies may be purchased in either language of W. S. George & Co., of Lansing, Mich., at the following prices, cash to accompany the order:—

100 copies for	$3.00	400 copies for	$7.00
200 " "	4.50	500 " "	8.00
300 " "	6.00	1,000 " "	14.00

The order should state whether they are wanted in the English, or in the German language.

what has occurred at other times in this State, and in other States, it is believed that had there been no State Board of Health, and no prompting or aid to the system of local boards of health, the invasion of small-pox into the State so often, and in so many places, could not have been resisted so successfully, and a general epidemic would have prevailed throughout the State.

But though the work of the State Board of Health, in relation to the prevention and restriction of small-pox, has proved very useful, the fact remains that to the local boards of health, and more particularly to the local health officers, belongs the credit of the very general success of the hand-to-hand conflict with the disease; and it is believed that their success has never before, in the history of the State, been paralleled.

In order to indicate somewhat the success which in many cases has attended the efforts of the health officers to restrict this disease, the outbreaks (which have been fully described and commented on, and the names of the health officers who performed the labor given in the preceding pages), may here be briefly referred to by the number of cases and the number of deaths in each locality, where known, as shown in the following table:—

*TABLE.—Showing the number of cases of small-pox and varioloid, and number of deaths therefrom in different localities in Michigan, during the year ending September 30, 1882. Arranged by divisions of the State.**

DIVISIONS AND LOCALITIES.*	Cases of Small-Pox.	Deaths from Small-Pox.
All localities	589	159
UPPER-PENINSULAR DIVISION.*		
Marquette, Marquette county	9	2
Breen, Menominee county	3	2
Menominee, Menominee county	2	1
Spalding, Menominee county	....	30
NORTHWESTERN DIVISION.*		
Traverse City, Grand Traverse county	1	....
Bingham, Leelanaw county	56	24
Kasson, Leelanaw county	5	2
Leelanaw, Leelanaw county	3	0
Manistee, Manistee county	10	4
Cadillac, Wexford county	2	....
CENTRAL DIVISION.*		
Burton, Genesee county	1	1
Flint, Genesee county	49	6
Mt. Morris, Genesee county	7	2
Montrose, Genesee county	1	0
Lansing, Ingham county	1	0
Danby, Ionia county	1	0
Ionia township, Ionia county	5	0
Orange township, Ionia county	30	4
Portland, Ionia county	3	....
Sebewa township, Ionia county	18	3
Iosco, Livingston county	1	....
Crystal, Montcalm county	4	....
Stanton, Montcalm county	2	....
SOUTHWESTERN DIVISION.*		
Plainwell, Allegan county	4	0
St. Joseph, Berrien county	1	....
St. Joseph township, Berrien county	1	....
Marcellus, Cass county	3	0
Bangor, Van Buren county	2	....
Geneva, Van Buren county	9	1
Hartford, Van Buren county	7	....
NORTHERN DIVISION.*		
Custer, Antrim county	3	2
Mancelona, Antrim county	11	0
Milton, Antrim county	12	10
Harbor Springs, Emmet county	1	....
Rapid River, Kalkaska county	29	5
WESTERN DIVISION.*		
Grand Rapids, Kent county	104	28
Walker, Kent county	2	0
White Cloud, Newaygo county	12	2
Everett, Newaygo county	16	5
Big Prairie, Newaygo county	3	1
Reed City, Osceola county	4	1
Polkton, Ottawa county	1	....
BAY AND EASTERN DIVISION.*		
Bay City, Bay county	8	0
Deerfield, Lapeer county	1	0
East Saginaw, Saginaw county	11	3
Saginaw City, Saginaw county	1	....
Kimball, St. Clair county	7	0
Port Huron City, St. Clair county	3	....
Port Huron township, St. Clair county	9	2
St. Clair township, St. Clair county	4	....
Elkland, Tuscola county	1	....
SOUTHERN-CENTRAL DIVISION.*		
Union City, Branch county	1	0
Albion, Calhoun county	1	0
Battle Creek, Calhoun county	9	5
Marshall, Calhoun county	1	0
Kalamazoo, Kalamazoo county	11	1
Kalamazoo township, Kalamazoo county	4	....
Leesburg, Kalamazoo county	12	0
Park, St. Joseph county	4	....
SOUTHEASTERN DIVISION.*		
Monroe, Monroe county	2	....
Milford, Oakland county	6	....
Pontiac, Oakland county	4	....
Detroit, Wayne county	52	12
Greenfield, Wayne county	3	....

* Exhibit 1, showing the counties in each division may be found on page 287.

It is proper to remember that even in those places where, as at Flint, Portland, Orange township, etc., the disease was not immediately restricted, it was not in every case the fault of the health officer; for at Flint the health officer promptly made great efforts, but was unsuccessful because of the opposition of medical practitioners and citizens, who so interfered as to prevent his efforts from being successful. Grand Rapids seems to have suffered most. Probably this was in part due to its close relations with Chicago, from which city small-pox was four times introduced into Grand Rapids.

In Detroit small-pox was introduced many times, there being twenty-five different outbreaks from Sept. 30, 1881, to June 15, 1882; nearly all of them were confined to the first case. It will be seen from the table that in sixteen different places the disease was confined to the first case.

Safety of citizens from communicable diseases depends very greatly upon the activity, faithfulness, and skill of the local health officer, in dealing properly with every case upon its appearance; but the local officer cannot always prevent the introduction of disease from abroad. It is believed that the introduction of small-pox into so many places, during the year just passed, was in great measure due to the unusual immigration,* and the coincident prevalence of the disease in foreign countries from and through which the immigrants came.

TYPHOID FEVER IN MICHIGAN IN THE YEAR ENDING SEPT. 30, 1882.

Special letters were not generally written asking for reports of outbreaks of typhoid fever, but it is the duty of health officers to make such reports,† and it was reported by some health officers and others, abstracts of whose reports follow:—

Dr. W. H. Smith, health officer of St. Clair, reported a case of typhoid fever contracted on board a steamship on the lakes, and a subsequent case in the same family with the first case, as follows, received January 19, 1882:—

Of typhoid fever we have had two cases. The former of these was contracted on the steamer City of Detroit, and the latter was in the same household. In addition to these I have heard reports about the existence of two other cases, but for certain reasons am of the opinion that the diagnosis was erroneous. The two cases in the Feldmeyer family are, to the best of my knowledge, the only cases of genuine typhoid which have occurred within the city limits.

Typhoid fever has also existed to some extent in the surrounding country. There the disease appeared to be generated *de novo*. The wells, in these instances, may have exerted a causative influence. In these the water during the past exceedingly dry summer was well nigh or quite exhausted. In many instances farmers were obliged to supply their families with water drawn from the river. The bottom of the wells, as a consequence, became very foul; in fact was reduced to a condition similar to that of a dried up mill-pond. They were not cleansed, as they should have been, but allowed to refill. The water from these, though foul and unfit, was used for drinking and other purposes. This, so far as I have been able to learn, was the history of the water-supply in every family where the fever apparently sprang up anew, and this fact would suggest the possibility of the water, from a source thus polluted, being an essential factor in its production.

Another item has occurred to me as worthy of mention. In this and previous years many cases of typhoid fever, which commenced on ship-board, subsequently came to land for treatment. One

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* An account of measures taken to prevent the introduction of disease by immigrants into and through this State, is published in this volume, and may be found on pages 436–43, under the title of the Immigrant Inspection Service.

† The circular on "Work of Health Officers," printed on pages 262–273 of this volume, clearly sets forth this duty, in paragraph 10, page 266, and on page 270, taken in connection with the law quoted in the foot-note on page 267 of this volume.

of these in my own hands, and the remainder in the hands of different physicians, have all terminated fatally. In some fifteen or twenty cases of which I have knowledge, where the disease originated in that manner and was subsequently brought to land, there has not been a single recovery. Possibly these cases may have been exceptional, or the disease thus originating may possess greater virulence. If so it raises the query, upon what does the increased fatality depend?

Dr. Hugh McColl, health officer of Lapeer, reported cases of typhoid fever where, from the position of the well and the character of the soil, he believed the water to be the source of the disease. A sample of the water was analyzed by a competent chemist, who reported that there was nothing in the character of the water to suggest organic contamination. This fact being reported to Dr. McColl, he wrote the following letter, dated Feb. 6, 1882:—

Yours of the 3d inst. is at hand containing the analysis of the water sent to you. Accept my thanks for the same, and though the chemical analysis does not show the water to be dangerous, yet the history is, to say the least, suspicious. I think that rarely can an organic poison, such as I believe that of typhoid fever to be, be separated from the water by the chemist. Another factor of importance in the case is that the outbreak of fever took place during the copious rain-fall of both seasons, and as the soil is very porous, it may be possible that the washing of the soil at that time carried into the well the *materies morbi* that caused the fever, and as soon as the water fell to its ordinary level, and little or no water in the privy vault, that all the poison might be removed, or at least a great portion of it, within a comparatively short time, for there is but little depth of water in the well in ordinary dry weather, such as we have had for a month or six weeks. An analysis two months ago might give an entirely different result from now. As I stated in my first communication on this subject, there are five other houses within a short distance exposed to all the conditions of the two in which typhoid fever made its appearance, except the use of the water, and since we discontinued the use of the water in that well no new cases have appeared, even in these families. Though the water gives evidence of purity I must consider it as only evidence that the chemist did not find the impurity which may or may not be present in the water at the present time, *i. e.*, merely negative evidence. I shall act on the assumption that that well is dangerous, and shall try to prevail on the owner to close it up and dig one where there will be at least no apparent danger from privy-vault sewage.*

Dr. N. A. Dryer, health officer of Bath township, reported a case of typhoid fever on June 6, 1882, in a young lady who came home sick, from the agricultural college, near Lansing, where she was employed in the dining-hall. This information was at once communicated to the president of the college with the suggestion that the water-supply be examined for impurities. The president replied that it should at once be done, and on June 22, 1882, he wrote as follows:—

I would say in further reply to your letter of the 8th inst, that I made no delay in asking Dr. Kedzie to examine the water used in the dining-hall. He had pronounced it wholesome some time ago, but now found it unwholesome, and I had the pump at once removed. Dr. Kedzie has examined the water now in use and says it is good.

There has been no report of any typhoid fever at the college. It seems possible, however, that it may have been prevented by the judicious action by President Abbot, although there is no certainty as to where the young lady mentioned by Dr. Dryer contracted the disease.

Typhoid fever has been reported at two State institutions, but no detailed report has yet been received.

* [The circular issued by this State Board, relative to the work of health officers, contained suggestions on this subject, as may be seen by referring to paragraph "5," on page 6 of the circular, page 267 of this volume.—H. B. B., Sec. S. B. of H.]

MEASLES.

Dr. W. W. Collins, health officer of Albion, reported on Jan. 17, 1882, the prospect of a large number of cases of measles, and said he had heard of 20 cases.

Dr. C. L. Chandler, health officer of Richmond, Macomb Co., reported an outbreak of measles on Feb. 20, 1882, stating that there had been one death, a girl aged 17 years, who died from the complication of capillary bronchitis. Quite a number of adults had been attacked.

J. R. Blake, health officer of Clarendon, Calhoun Co., reported March 15, 1882, that measles prevailed quite extensively in his township, but comparatively few of the cases were reported.

Dr. R. F. Stratton, health officer of St. Joseph, Berrien Co., reported in April and May an extensive outbreak of measles in St. Joseph, Royalton, Lincoln, and Benton townships, and said on May 13 "a child which showed measles Thursday landed in New York the Monday before."

Dr. G. G. Woodmansee, health officer of Little Prairie Ronde, Cass Co., reported measles in April and July; one death April 22, man, aged 22 years.

Dr. P. S. Root, health officer of Monroe, wrote on May 17, 1882: "Measles can be considered epidemic here."

Dr. J. E. Scallon, of Hancock, Houghton Co., reported on July 21, 1882, the first case of measles which had been in his township for months.

Edwin Harkness, clerk of the local board of health of Batavia township, Branch Co., reported on July 22, 75 cases of measles and some deaths.

The foregoing report on Communicable Diseases in Michigan during the Fiscal Year ending September 30, 1882, including the history of some of the work by the State and local boards of health, in preventing and restricting the spread of diphtheria, scarlet fever, small-pox, typhoid fever, and measles, is respectfully submitted.

HENRY B. BAKER.
Secretary.

IMMIGRANT-INSPECTION SERVICE IN MICHIGAN, JUNE 1 TO SEPT. 30, 1882.

A STATEMENT PREPARED IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH, IN PART FROM WEEKLY REPORTS BY THE INSPECTORS AT PORT HURON AND DETROIT.

In July, 1881, this State Board of Health passed a series of resolutions* requesting the National Board of Health to establish a system of inspection of immigrants for the purpose of preventing the introduction of contagious diseases into the United States. The resolutions particularly asked for such inspection at the port of Port Huron, Michigan, at which port more immigrants then entered than at any other port in this country, except at the port of New York, the number at Port Huron having been about 100,000 annually. The subject was constantly and earnestly urged on the National Board of Health, and as a result of the action of this and other State and Municipal Boards of Health, and the manifest necessities of the case, there was a conference called at the city of Port Huron, Mich., on May 18, 1882, at which the subject of the inland immigrant-inspection, and inspection at ports of entry other than those on the Atlantic coast, was to be considered. At this meeting were representatives of the National Board of Health, several State and local Boards of Health interested in the subject, and also representatives of lines of travel. The following resolutions were adopted by this conference:—

Resolved, That we deem it important that a system of immigration inspection shall be immediately inaugurated, which shall apply to all trunk lines of railroad carrying immigrants, to prevent the introduction of small-pox into the United States and from one State into another.

Resolved, That the National Board of Health be requested to advise and co-operate with and through the State Boards of Health, and the several local authorities of health, whenever it may be considered advisable to carry out a proper system of inspection and control of all persons traveling through the several States with reference to the limitation of small-pox.

Resolved, That the National Board of Health be requested to erect or otherwise provide and furnish on the borders of States, as may be required, such temporary buildings as may be necessary, and provide for the care and maintenance of persons on emigrant trains suffering from small-pox, when committed to these hospitals.

Resolved, That inasmuch as a considerable number of the immigrants coming into the United States, or passing through them, necessarily travel through the Dominion of Canada, we do cor-

* Printed on pages xlii-xliii of the Annual Report of the Mich. State Board of Health for the year 1881.

dially invite the co-operation of the Canadian authorities in inaugurating a system of inspection of such immigrants, in order to prevent, as far as possible, the spread of small-pox.

Resolved, That this conference commend the action of such transportation companies as have established a system of inspection and the issuing of protection cards, and earnestly request all other steamship companies engaged in transportation to co-operate with local and other inspectors of emigrants in transit, as a means of suppressing the spread of small-pox.

Resolved, That this conference is gratified to learn that many railway lines have already pledged co-operation in efforts of inspection, and we earnestly request all other railway trunk lines engaged in the transportation of immigrants to co-operate in inspection and the enforcement of regulations looking to the limitation of small-pox.

Resolved, That it is desirable that this system of immigrant-inspection shall begin generally throughout the country by June 1, 1882.

The plan contemplates the vaccination of immigrants at the port of departure, or on ship-board, the giving to each person a card printed in several languages stating that vaccination has been performed, and that the card should be preserved. The card also bears the name of the line of steamers, the steamship, the date of vaccination, and the signature of the ship's surgeon; also the name of the person vaccinated. On the front side a sample reads something like the following:—

WHITE CROSS LINE.

—STEAMER "PIETER DE CONINCK."—

(Blank for name of person vaccinated.)

....

VACCINATED.

....,

Surgeon.

The reverse side may be as follows, in several languages:—

—PASS.—

Keep this card to avoid detention at Quarantine and on Railroads in the United States.

At the ports of entry the immigrants are rigidly examined by the inspectors of the National Board of Health or of the local or State Boards, and all those not believed to be sufficiently protected from small-pox are revaccinated and receive passes. The passes of those believed to be protected are endorsed by the inspector. Those known or suspected of having any communicable disease may be detained until evidence is positive, and cared for if sickness comes, or sent along if the suspicions prove unfounded. The immigrants are then be examined, while in transit and without detention, at the next inspection-station, and all those then believed to be inadequately protected may be revaccinated and receive passes; those holding passes and not yet protected from small-pox, have their passes revoked, and, on vaccination, receive

new passes. Those absolutely refusing to be vaccinated do not receive passes, and should be carefully watched as "suspects," by each inspector. Those sick with diseases not communicable may receive passes stating the facts, judgment being used relative to vaccinating them. The passes of those believed to be protected are indorsed by the inspectors.

The effort to prevent the introduction and spread of contagious diseases by immigrants depends for its most complete success upon securing action at the port of departure, or on board the ship on which the immigrant crosses to this country; also at the ports where the immigrant enters this country, and, finally, his surveillance to his destination.

The system has been given briefly in detail, because it is a new movement in sanitary service, and should be given publicity in order to receive public examination and support if found worthy.

The executive committee of the National Board of Health decided to establish inspection stations in Michigan at Port Huron and Detroit, and the Michigan State Board of Health was requested to recommend persons as such inspectors, which was done, and the following physicians were recommended and appointed:—

At Port Huron: Hiram R. Mills, M. D., Supervising Sanitary Inspector; C. E. Spencer, M. D., and C. B. Stockwell, M. D., Inspectors. At Detroit: John J. Mulheron, M. D., and Rudolph C. Teschan, M. D., Inspectors.

These inspectors were ordered to begin inspections on June 1, 1882, and were placed under the general supervision of the Secretary of the State Board of Health. The law and regulations under which the inspection system was inaugurated related to small-pox and the vaccination of immigrants, and there may be question whether the inspectors can, without the aid of local authorities, detain cases of diphtheria, scarlet fever or measles; but much information is being gained respecting the introduction of such dangerous diseases into this country. The inspectors have reported to this office each week, and their weekly reports have been compiled for this article.

The inspection-system was ordered to begin June 1, 1882, and in Michigan has been confined to the two places—Port Huron and Detroit. Port Huron is the most important of the two stations, because of the large number of immigrants who come by lines of steamers which have their termini at Quebec and Montreal, and the large number of immigrants from the Canadian provinces, both of which classes first touch our soil at Port Huron. Their inspection there is the first they have had, and it should be very thorough. The inspectors at Detroit examine some immigrants who first enter this country at Detroit; but the greatest proportion of those examined at Detroit have already been examined, and some of them vaccinated, by surgeons on board ship, by inspectors stationed at the ports of entry, or on lines of travel. It is important then, at Port Huron, that the examinations should be thorough, and the vaccinations are numerous, many of them, as may be seen from the table compiled from the reports, being primary vaccinations. At Detroit the examination should detect any disease developed since previous inspection, and the revaccinations are of consequence. Until late in the summer the steamship lines arriving at Quebec and Montreal did not vaccinate their passengers.

The work performed at the stations of Port Huron and Detroit will be given separately and afterwards a combined statement will be made.

INSPECTION OF IMMIGRANTS AT PORT HURON, JUNE 1 TO SEPT. 30, 1882.

The inspectors appointed for Port Huron were Dr. Hiram R. Mills, supervising sanitary inspector, and Dr. C. B. Stockwell and Dr. C. E. Spencer

inspectors, and they were ordered to begin inspection on June 1, 1882. On May 26 the inspectors, unofficially, found a case of small-pox on board an immigrant train in the person of a child six or seven years of age; she was well along in the pustular stage, but before word could be sent to the health officer of the city of Port Huron, the train moved away on its way to Chicago with the case of small-pox on board. A telegram was sent by Dr. Mills to the Secretary of the State Board of Health at Lansing, who notified the health officer of Chicago of the proposed entry of small-pox into that city. After the train had left Port Huron it was learned that 40 passengers had been left in the hospital at Montreal suffering from "measles." On May 29 another case of small-pox was found among immigrants arriving at Port Huron from New York by way of Buffalo. Dr. Mills reported that the case was a Polish child about 5 or 6 years old, and that the child had been broken out at least 6 or 8 days. As soon as the case was found it was turned over to the health officer of Port Huron, who locked the car and side-tracked it in quarantine while a hospital was being built. From the health officer of Port Huron, Dr. D. M. Bennett, the following facts regarding this case are learned:—

The Timeo family landed in New York on May 26, from the steamship Brunswick, from Bremen. The child was sick one week and broken out before reaching New York. They said they all were vaccinated on board the ship, excepting the sick child, but there were no evidences of it visible at Port Huron. They said they were not examined in New York at all. The mother aged 42 years, Margaret aged 14 years, and John aged 11 years, and a man aged 42, with the child aged 5 years, which was sick with small-pox, completed the party. Their destination was Streator, Illinois. All the party besides the sick child had had small-pox in the old country some years before, time not definitely known. The sick child was not vaccinated on ship-board. The child recovered, and the whole party were afterwards sent on to their destination.

Because of the fact of so many immigrants arriving at Port Huron as a port of entry, and never before having undergone inspection, and because of the vigilance of the inspectors, the number of vaccinations performed (7,993) in a total of 17,909 immigrants inspected, is large. Of these 7,993 vaccinations, 464 were primary in persons over 5 years of age; 572 were primary under 5 years of age; and 6,926 were revaccinations; 31 more were primary vaccinations, ages unknown. Of the 17,909 immigrants inspected, 4,736 (or 26 per cent) had old vaccination marks which were considered protective by the inspectors; 460, or two and one-half per cent, had had previous attacks of small-pox. There were found 228 recent vaccinations which were working, and 144 which were not working. Evidences of recent vaccination, if unsuccessful, nearly always disappear before the immigrant reaches Port Huron. There were 3,164 passes examined, and their holders found protected. There were 1,887 passes revoked, the holders believed not to be protected. These were revaccinated and new passes issued. There were 1,516 passes withheld for various reasons, such as sickness, infirmity, refusal to be vaccinated, lack of virus, etc. The inspectors issued 12,040 passes to persons they believed to be protected. There were 130 persons found sick on trains, there being 54 cases of measles, and 4 cases of whooping cough.

The following table exhibits in tabular form the work performed at the inspection station at Port Huron:—

TABLE 1.—*Showing by weeks from June 1 to September 30, 1882, inclusive, the number of trains and of immigrants inspected at Port Huron, Michigan, the number of immigrants passed by reason of old vaccinations, the number recently vaccinated in whom it was working, and the number not working, the number of primary and of secondary vaccinations performed, the number of passes examined, revoked, issued, and withheld, the number of persons found sick in transit, and some of the causes of the sickness.*

Week ending Saturday,—	Trains inspected.	Immigrants inspected.	Found protected by: Old vaccination* and passed.	Found protected by: Previous attack of small-pox.	Found protected by: Recent vaccination found working.	Recent vaccination found not working.††	Vaccinations performed: Primary, 5 years old and over.	Vaccinations performed: Primary, under 5 years old.	Vaccinations performed: Revaccinated.	Vaccinations performed: Total vaccinations performed.	c Passes: Examined and holders found protected.	c Passes: Revoked, holders not protected.	c Passes: Issued.	c Passes: Withheld.	Persons sick on trains.	Cases of measles on trains.
June 3	13	437	......	......	....	....	....	....	......	......	......	......	......	......	6	4
June 10....	21	1,823	740	62	....	....	20	127	[illegible]	197	255	......	233	b 617	‡ 7	6
June 17....	45	1,028	974	17	5	23	20	20	[illegible]	53	596	0	1,028	4	8	2
June 24	36	1,591	527	30	10	....	60	21	34	105	780	0	662	a 145	13	10
July 1.....	39	1,271	535	49	19	....	116	[illegible]	259	388	253	0	1,015	6	2	1
July 8.....	40	915	327	13	8	16	10	85	371	416	169	4	728	28	8	0
July 15....	39	1,187	311	33	40	....	25	28	608	661	[illegible]	0	827	14	15	10
July 22....	66	726	128	17	10	....	10	14	339	383	168	0	528	30	17	15
July 29....	53	732	46	9	6	17	4	8	474	486	136	350	546	50	8	6
August 5...	43	561	123	3	9	....	†	†	393	429	60	110	498	6	2	0
August 12..	50	399	87	6	0	20	9	18	271	298	47	50	338	10	§ 4	0
August 19..	51	703	63	15	16	65	7	10	489	506	64	324	536	57	5	0
August 26..	48	630	106	12	4	....	4	7	311	322	4	3	417	105	¶ 6	0
Sept. 2....	46	1,136	134	25	17	1	10	40	507	557	61	299	733	322	8	0
Sept. 9....	47	933	128	20	17	....	20	46	623	689	65	261	854	16	5	0
Sept. 16...	34	1,034	105	45	33	....	54	43	754	851	5	56	1,046	14	6	0
Sept. 23...	35	1,056	187	47	24	....	33	58	637	753	54	149	932	31	** 3	0
Sept. [illegible].	36	1,127	165	57	4	....	72	64	768	804	66	272	1,127	0	7	0
Totals, 18 weeks..	741	17,909	4,736	460	228	144	464	572	6,928	7,035	3,164	1,687	12,040	1,516	130	54

* After July 1 the number in this column had been vaccinated within 5 years, for reasons stated in the document on small-pox, issued by the Mich. State Board of Health, paragraph numbered 7, or on pages 296-7, of the Annual Report of the Board for 1881.

† Number primarily vaccinated, 31; number of those over 5, unknown.

‡ Two dead on trains, cause unknown.

§ One case of whooping-cough.

¶ Two cases of whooping-cough.

** One case of whooping-cough.

†† The evidences of recent vaccination, if unsuccessful, disappear before reaching Port Huron.

a Passes withheld from ⅔ because of improper physical condition; from ⅓ because of refusal to be vaccinated.

b Passes withheld on account of lack of virus with which to vaccinate.

c Cards certifying the holders were vaccinated, or otherwise protected from small-pox.

INSPECTION OF IMMIGRANTS AT DETROIT, JUNE 1 TO SEPT 30, 1882.

The inspection of immigrants at Detroit began June 1, 1882, with two inspectors, Dr. J. J. Mulheron, and Dr. R. O. Teschau.

Reports of the first few weeks' work at Detroit are not so full as those made afterwards. From June 1 to September 30 the whole number of immigrants

inspected was 22,901. These were on 244 trains or steamers. The number sick among these immigrants was 48, of whom 31 had measles, three had whooping cough, two had vaccinal eruption, and one had tinea tonsurans.

Of the total number of immigrants the inspectors vaccinated 535. Twenty-two were vaccinated previous to the keeping of any record as to the vaccination being primary or secondary. After July 1, when such a record was begun, 150 were primary and 363 were secondary vaccinations. Of the 13,557 who were inspected from July 1 to Sept. 30, 10,342 (or 76 per cent) bore marks of old vaccinations, and and 265 (or 2 per cent) had had small-pox at some previous time; 806 bore working vaccinations, and 682 bore marks of recent vaccination, but the vaccination was not working. This large proportion not working is probably because the vaccinations were performed on the cars at Toledo, Cleveland, Pittsburg, or Hornellsville, where there were inspectors such a short time before the arrival of the immigrants at Detroit. From July 1 to September 30, there were 10,993 passes examined and 1,671 passes issued. The following table gives the facts in tabular form for each week from June 1 to Sept. 30, 1882:—

TABLE 2.—*Showing by weeks from June 1 to September 30, 1882, inclusive, the number of boats and trains, and of immigrants inspected at Detroit, Michigan, the number of immigrants passed by reason of old vaccinations, the number recently vaccinated in whom it was working, and the number not working, the number of primary and of secondary vaccinations performed, the number of passes examined and issued, and the number of persons sick in transit, and some of the causes of the sickness.*

JUNE 1 to SEPT. 30, 1882. WEEK ENDING	Boats and trains inspected.	Immigrants inspected.	Immigrants inspected who had				Vaccinations performed.			Passes. ‡		Sick in transit.	Cases of measles.
			Old vaccinat'ns and were passed.	Previously had small-pox.	Recent vaccinations working.	Recent vaccinations not working.	Primary.	Secondary.	Total.	Examined.	Issued.		
June 3	7	1,745	------	----	------	------	----	----	2	----	----	1	1
June 10	16	2,605	------	----	------	------	----	----	6	----	----	8	6
June 17	15	1,742	------	----	------	------	----	----	1	----	----	3	1
June 24	13	1,644	------	----	------	------	----	----	7	----	----	12	8
July 1	13	1,608	------	----	------	------	----	----	6	----	----	2	1
July 8	12	2,179	932	19	71	163	2	0	2	1,870	309	3	9
July 15	15	1,210	970	26	218	93	26	3	29	857	333	7	5
July 22	15	728	630	15	37	44	19	7	26	575	147	6	6
July 29	15	1,927	1,715	36	141	115	11	69	80	1,668	246	0	--
August 5	15	538	467	11	26	28	6	24	29	438	72	0	--
August 12	14	950	864	21	34	31	17	32	49	826	114	2	--
August 19	17	743	679	26	52	60	18	15	33	705	41	1	1
August 26	14	500	461	18	21	10	5	15	20	466	24	0	--
Sept. 2	16	983	820	21	67	32	13	41	54	843	100	0	--
Sept. 9	14	693	600	20	62	16	9	23	32	608	66	†3	--
Sept. 16*	13	1,264	571	22	37	28	16	27	43	568	50	0	--
Sept. 23	11	932	730	16	20	85	6	78	84	[illegible]	95	0	--
Sept. 30	9	905	853	14	20	27	3	29	32	856	44	0	--
Totals—18 weeks.	244	22,901	10,342	265	806	682	150	363	535	10,993	1,671	48	31

*Of the 1,264 inspected this week 646 were Mormon immigrants, who were all provided vaccination cards from the ship's surgeon. They were closely inspected, but the time allowed, the Railroad company not having given the usual notice of their arrival, prevented an endorsement of all the cards, or the inspection of all the arms. The intelligent agents who traveled with them assured us that fully 70 per cent of the ship vaccinations were working, and the proportion of those inspected corroborated this statement.

† Whooping-cough, 3 cases.

‡ Cards certifying the holders were vaccinated, or otherwise protected from small-pox.

SUMMARY STATEMENT OF IMMIGRANT-INSPECTION AT PORT HURON AND DETROIT FROM JUNE 1 TO SEPT. 30, 1882.

The following table shows the principal facts of the inspection service in Michigan during the time stated. Of 40,810 immigrants inspected, 15,078 old vaccinations were considered protective and the persons passed; 8,528 immigrants were vaccinated, by far the larger proportion of them (7,289) being revaccinations.

TABLE 3.—*Showing for 18 weeks, from June 1 to September 30, 1882, the number of boats and trains, and of immigrants inspected at Port Huron and Detroit, Michigan, the number of immigrants passed by reason of old vaccinations, the number recently vaccinated in whom it was working, and the number not working,‡ the number of primary and secondary† vaccinations performed, the number of passes examined and issued, the number of persons sick in transit, and two of the causes of sickness.*

PLACE of INSPECTION	Boats and trains inspected.	Immigrants inspected.	Immigrants inspected who had: Old vaccinations and were passed.	Old vaccinat'ns and were passed (per cent).	Previously had small-pox	Previously had small-pox (per cent).	Recent vaccinations working	Recent vaccinations not working	Vaccinations performed: Primary.	Secondary.	Total.	§ Passes: Examined.	Issued.	Sick in transit.	Cases of measles.	‖ Cases of whooping-cough.
Port Huron	*741	17,909	4,736	26	460	2.5	228	‡144	1,067	6,926	7,993	3,164	12,040	130	54	4
Detroit......	244	22,901	10,342	45	265	1	806	‖682	†150	†363	535	10,993	1,671	48	31	3
Both Stations.	985	40,810	15,078	37	725	2	1,034	826	†1,217	†7,289	8,528	14,157	13,711	178	85	7

*Trains only.
† There were 22 vaccinations performed at Detroit during the first five weeks, which were not classified as primary or secondary.
‡ Evidences of recent vaccination, if unsuccessful, disappear before arrival at Port Huron.
§ Cards certifying the holders were vaccinated, or otherwise protected from small-pox.
‖ Many recent vaccinations too recent to ascertain whether effective or not.

There are published in this volume accounts of scarlet fever being twice introduced into this State during the year ending Sept. 30, 1882, by immigrants, the accounts of scarlet fever at Sault Ste. Marie and at Jamestown, on page 359. An account of diphtheria being brought to Northport, in this State, by immigrants, is given on page 378 of this volume. These are mentioned here to show that these diseases are introduced into this State by immigrants.

The immigrants who gave scarlet fever to the cashier in the store at Sault Ste. Marie were probably not inspected, for it was not until June 23, 1882, that the inspection of immigrants arriving in this State on *steamers* was ordered. The first inspection of immigrants on a steamer was at Detroit on July 7. The case of scarlet fever was reported July 3.

Immigrants may be exposed to small-pox at the port of departure, or on board ship, and the period of incubation be too far advanced by the time of arrival in this country to have vaccination protect them from the disease. Hence vaccination should be had at the port of departure.

As a matter of interest and instruction, the incubation periods of 26 communicable diseases, as given in a classified form by Dr. B. W. Richardson, LL. D., of London, England, is here given. The extract is from an address

delivered before the Sanitary Institute of Great Britain, as published in *Nature*, June 2, 1881. It is as follows:—

"He proceeded to indicate that there are twenty-six well known diseases of this kind, and they each have their special periods of incubation, which, though open to exceptions, are fairly regular. The period of incubation was that period which intervened between the acceptation of the poison which caused the disease, and the first manifestion of effect. Diseases might thus be grouped according to their stages of incubation into five classes: *Shortest, Short, Medium, Long, Longest*. The shortest period was [from] one to four days: under this head came plague, cholera, malignant pustule, and dissection poison. The second period was from two to six days, and under this head came scarlet fever, diphtheria, croup, erysipelas, hooping-cough, influenza, glanders, and pyæmia. The medium period was from four to eight days, and in it are included cow-pox and relapsing fever. The long period had ten to fifteen days, and included in it measles, mumps, [small-pox], typhus, and typhoid. The longest period, forty days, included syphilis, and might include hydrophobia." B. W. Richardson, M. D., Sanitary Institute, Great Britain. *Nature*, June 2, 1881.

The reader will see that a case of communicable disease, contracted at the port of departure or on ship-board, may, by reason of the rapidity of travel and the length of the period required for the disease to develop, (known as the period of incubation) develop while in transit through this country to the destination of the immigrant. It may also be seen that by frequent examinations by competent inspectors, that disease could be detected on its first appearance, and the person taken from the train or vessel and cared for until recovery, and then sent on to his destination. In the case of those diseases for which the immigrant is not removed from the train, extraordinary care should be taken to prevent the spreading of the disease. By this means small-pox and other diseases may be prevented from being so frequently introduced at so many places, and thus much be accomplished toward preventing them from spreading to disastrous proportions in this country.

HENRY B. BAKER,
Secretary.

THE PRINCIPAL METEOROLOGICAL CONDITIONS IN MICHIGAN DURING THE YEAR 1881.

A REPORT BASED UPON A COMPILATION OF DATA SUPPLIED BY REPORTS OF METEOROLOGICAL OBSERVERS FOR THE STATE BOARD OF HEALTH, AND FOR THE UNITED STATES SIGNAL SERVICE.*—PREPARED IN THE OFFICE OF THE SECRETARY OF THE BOARD.

Close relations of health to weather are universally conceded; but an accurate knowledge of what those relations are can be gained only by long-continued records of systematic observations, carefully planned and skillfully studied. This report for the year 1881 is one of a series, the first one having been prepared for the year 1877, and published in the Annual Report of this Board for the year 1878. During the year 1881, monthly reports have been received from most of the old stations, and from two new stations, Marshall and Harrisville. The instruments at Mallory Lake were transferred to Hudson. The station at Minong, Isle Royale, was discontinued, because of the removal of the observer, and the instruments were returned to this office.

A copy of the form of register used by the observers for this office, and of the directions for taking and recording observations, was printed on pages 406-410 of the Report of this Board for 1881. The names of observers and their places of observation are stated in Exhibit 7, page 445, of this Report. Observations for less than half the year, or for less than half of any month, have not been used in this compilation, and observations not for the full year have not been included in the average lines made for the several localities represented in the various tables and exhibits. Not every one of the 32 stations named in Exhibit 7 was represented by complete records of all meteorological data provided for in the blank register; but the greatest number of the tables and exhibits contain data from as many as eighteen observers, in as many different parts of the State of Michigan.

*The following stations of the U. S. Signal Service kindly sent to this office for the year 1881 monthly reports of their regular tri-daily observations, in many cases corrected and reduced, and for the most part on blanks supplied from this office: Alpena, Detroit, Escanaba, Grand Haven, Marquette and Port Huron. The observers at these stations also made observations of ozone especially for this Board. For study in connection with reports of sickness some of the observations require a different elaboration from that given to them by the Signal Service Office. This is true especially of the record of the atmospheric pressure, which for study with sickness-reports requires to be corrected for temperature and instrumental error, but not to be reduced to sea level. To the Chief Signal Officer at Washington is sent each month a copy of the register of observations made at this office, and each week a copy of a weekly summary of said observations; a copy of this weekly summary is also sent each week to every observer reporting to this office.

EXHIBIT 7.—*Names of observers whose Reports are summarized in the following Meteorological Tables and Diagrams, their Places of Observation, and the Counties and Geographical Divisions of the State, in which these Places are siuated, and months for which reports were received from each observer.*

NAME OF OBSERVER.	Place of Observation.	County.	Division of the State.*	Months (inclusive) for which Registers were Received.
J. Gilligan, Sergt. Signal Corps, U. S. A.	Marquette	Marquette	U. P.	Jan. to Dec.
Charles Dill, Sergt. Signal Corps, U. S. A.	Escanaba	Delta	U. P.	Jan. to Dec.
A. B. Simonson, M. D.	Minong	Isle Royal	U. P.	Jan. to May.
Jas. A. Barwick, Sergt. Signal Corps, U. S. A.	Alpena	Alpena	N. E.	Jan. to Feb.
Jas. J. FitzGerald, Sergt. Signal Corps, U. S. A.	Alpena	Alpena	N. E.	March to Dec.
J. E. Fair	Harrisville	Alcona	N. E.	Jan to Dec.
Geo. R. Hancock, Sergt. Signal Corps. U. S. A.	Grand Haven	Ottawa	W.	Jan. to Feb.
Wm. A. Reid, Sergt. Signal Corps, U. S. A.	Grand Haven	Ottawa	W.	March to Dec.
E. S. Richardson, M. D.	Reed City	Osceola	W.	Jan. to Dec.
John S. Caulkins, M. D.	Thornville	Lapeer	B. & E.	Jan. to Dec.
W. O. Bailey, Sergt. Signal Corps, U. S. A.	Port Huron	St. Clair	B. & E.	Jan. to Sept.
E. A. Evans, Private, Signal Corps, U. S. A.	Port Huron	St. Clair	B. & E.	Oct. to Dec.
Fred Sweet	Hastings	Barry	C.	Jan. to Dec.
J. J. Grafton, Warden	State House of Correction, Ionia	Ionia	C.	Jan. to May.
Col. E. C. Watkins, Warden	State House of Correction, Ionia	Ionia	C.	July to Dec.
Prof. R. C. Kedzie	Agricultural College, near Lansing	Ingham	C.	Feb. to Dec.
Harry B. Turner	Office State Board of Health, Lansing.	Ingham	C.	Jan. to Dec.
A. W. Nicholson, M. D.	Otisville	Genesee	C.	Jan.
Mrs. M. M. Nicholson	Otisville	Genesee	C.	July to Dec.
Lee S. Cobb	Winfield	Ingham	C.	Jan. to Dec.
John Bell, M. D.	Benton Harbor	Berrien	S. W.	Jan. to May.
James S. Reeves, M. D.	Niles	Berrien	S. W.	Jan. to Dec.
Jacob Breedon	Adrian	Lenawee	S. C.	Jan. to July.
Prof. M. W. Harrington	University of Michigan, Ann Arbor	Washtenaw.	S. C.	Jan. to Dec.
J. H. Kellogg, M. D.	Battle Creek	Calhoun	S. C.	Jan. to July. Sept. to Dec.
Lyman P. Alden, Supt.	State Public School, Coldwater	Branch	S. C.	Jan. to July.
F. D. Parmelee	Hillsdale	Hillsdale	S. C.	Jan. to Aug. Nov. to Dec.
Orrin Dean, Jr.	Hudson	Lenawee	S. C.	Aug. to Dec.
Geo. C. Palmer, M. D., Supt.	Asylum for Insane, Kalamazoo	Kalamazoo	S. C.	Jan. to Dec.
Lieut. A. H. Boies	Mallory Lake	Hillsdale	S. C.	Jan. to July.
A. G. Gumaer	Marshall	Calhoun	S. C.	Jan. to May.
W. T. Drake	Marshall	Calhoun	S. C.	June to Dec.
Edwin Stewart, M D.	Mendon	St. Joseph	S. C.	Jan. to Dec.
Lewis Marvill	Park	St. Joseph	S. C.	Jan. to Dec.
Harrison Peters, M. D.	Tecumseh	Lenawee	S. C.	Jan. to July.
L. G. North, M. D.	Tecumseh	Lenawee	S. C.	Aug. to Dec.
Lawrence A. McLouth	Ypsilanti	Washtenaw.	S. C.	March, May, Aug., Oct, to Dec.
C. F. R. Wappenhans, Sergt. Signal Corps, U. S. A.	Detroit	Wayne	S. E.	Jan. to Dec.
Albert Yates	Washington	Macomb	S. E.	Jan. to Dec.

* The counties included in each division are stated in Exhibit 1, page 287.

EXHIBIT 8.—*Latitude and Longitude, Elevation above Sea Level, and the Average Temperature, and Average Barometric Pressure in 1881, at 32 Meteorological Stations in Michigan,—the names of the Stations being arranged in order by Latitude, highest first.*

LOCALITIES IN ORDER OF LATITUDE,—THOSE FARTHEST NORTH, FIRST.	Latitude North.	Longitude West from Greenwich.	Altitude (Approximate), above Sea Level,—Feet.	Height of Mercury in Cistern of Barometer, above Sea Level.	Average Temperature, 1881,—Degrees Fahr.	Average Atmospheric Pressure, 1881. Inches of Mercury, Corrected for Temp.
Minong	48°	88°50′	--------	--------	--------	--------
Marquette	46°33′	87°36′	638.07	673.	41 00	29.282
Escanaba	45°46′	87°14′	598.54	619.08	41.12	--------
Alpena	45°5′	83°28′	587.9	609.5	42.33	29.346
Harrisville	44°39′	83°18′	--------	--------	43.69	--------
Reed City	43°44′	85°28′	1016.	--------	46.51	28.865
Otisville	43°13′	83°31′	820.	--------	--------	--------
Grand Haven	43°5′	86°18′	595.8	616.3	48.23	29.348
Ionia	† 42°59′	† 85°4′	688.1	--------	--------	--------
Port Huron	42°58′	82°29′	600.	630.	45.80	29.340
Thornville	* 42°55′	* 83°12′	‖ 975.	980.	49.62	28.935
Agricultural College, near Lansing	42°44′	84°29′	834.	--------	48 73	29.087
Lansing	‡ 42°44′	‡ 84°33′	§ 800.	--------	49.59	29.017
Hastings	* 42°40′	* 85°17′	§ 750.	--------	--------	--------
Washington	42°40′	83°	746.33	752.33	47.30	--------
Winfield	* 42°30′	* 84°34′	--------	--------	48.18	--------
Detroit	42°20′	83°2′	583.3	635.	51.40	29.313
Battle Creek	* 42°20′	* 85°11′	§ 800.	--------	--------	--------
Kalamazoo	42°18′	85°35′	975.	995.	49.02	29.112
Ann Arbor	42°17′	**	930.	936.	47.95	29.039
Marshall	42°17′	84°58′	--------	--------	--------	--------
Ypsilanti	* 42°15′	* 83°36′	780.	--------	--------	--------
Benton Harbor	* 42°8′	* 86.28′	§ 582.	--------	--------	--------
Mendon	* 42°2′	* 85°29′	§ 872.	--------	48.66	29.103
Park	††	††	--------	--------	48.50	--------
Tecumseh	* 42°1′	* 83°57′	825.	840.	47.87	--------
Coldwater	* 41°58′	* 85°0′	§ 989.	--------	--------	--------
Hillsdale	¶ 41°55′	¶ 84°34′	§ 1139.	--------	--------	--------
Adrian	¶ 41°54′	¶ 83°59′	§ 815.	--------	--------	--------
Hudson	* 41°53′	* 84°21′	970.	--------	49.64	--------
Mallory Lake	§§	§§	--------	--------	49.64	--------
Niles	* 41°51′	* 86°16′	§ 695.	--------	49.33	--------

* Estimated from lines on a map of Michigan issued by the General Land Office, Department of the Interior, 1878. For stations having no reference mark, the latitude and longitude were stated by the observer on the meteorological reports received.

† The exact latitude and longitude of the astronomical post at Ionia is 42°58′ 52.53″ N. and 85°3′ 49.20″ W.

‡ The exact latitude and longitude of the astronomical post placed in the ground near the new Capitol at Lansing, by the U S. Lake Survey in 1875, as determined by observations then made, is 42°43′ 53.11″ N., and 84°33′ 19.68″ W.

§ Estimated from data on "Railroad Profiles," pages 179-187, Annual Report of the State Board of Health for 1878.

‖ Estimated from data in Tackabury's Atlas of the State of Michigan.

¶ By table in Tackabury's Atlas of Michigan.

** 6°41′ west from Washington, which is about 77°3′ west from Greenwich.

†† 3½ miles west from Mendon.

§§ 3½ miles from Hudson, 2 miles west and 1½ miles south.

METEOROLOGICAL CHARACTERISTICS OF THE YEAR 1881.

By observations made by Dr. Kedzie, at the State Agricultural College, near Lansing, the average temperature for 1881 was 1.41° F. higher than for 1880, and 2.03° higher than the average for the seventeen preceding years. The annual range of temperature was 6° greater than in 1880, and 3° greater than the average annual range for the 8 preceding years. The average monthly range of temperature was 2° less than in 1880, and 6° less than the average for the 8 preceding years. The average daily range of temperature was 1.46° greater than in 1880, and 1.24° less than the average for the preceding 7 years. The average cloudiness was two per cent greater than in 1880. and one per cent less than the average for the 17 preceding years. The rainfall (rain and melted snow) was 9.23 in. less than in 1880, and 3.64 in. greater than the average for the 17 preceding years. The day ozone was slightly less than in 1880, and slightly more than the average for the preceding 9 years. The night ozone was considerably greater than in 1880, and slightly more than the average for the preceding 9 years. The average atmospheric pressure for the year was .071 in. greater than in 1880, and .052 in. greater than the average for the preceding 6 years.

In Exhibit 9, pages 448–9, is given by year and months a comparison of conditions in 1881 with those in 1880, and with averages for periods of years. September, December, May, October, August, November, and July (naming months in order of greatest difference) were months in which the average temperature in 1881 was higher than the average for corresponding months in the preceding 17 years; January, June, February, March, and April were months in which the average temperature in 1880 was lower than the average for corresponding months in the preceding 17 years.

The following general remarks are taken from the monthly reports of meteorological observers, relative to temperature, frosts, effects on vegetation, migration of birds, etc., in 1881:—

JANUARY.

Jan. 1881 was the coldest, judging from its mean temperature, of any Jan. since 1875. The mean temperature for Jan. 1875 was only 10° while for Jan. 1881 it was 14°.—*Serg't. James A. Barwick, of Alpena, on report for Jan.*

Frost occurred on Jan. 2, 3, 11, 18, 20, 28.—*Serg't. Geo. R. Hancock, Grand Haven, on report for Jan.*

A very cold month. Much snow, sleighing good. No drifting. Ice about 25 inches thick, ground deeply frozen, but depth not ascertained.—*John S. Caulkins, M. D., Thornville, on report for Jan.*

Meadow larks observed on the 1st and 10th.—*A. H. Boies, Mallory Lake, on report for Jan.*

FEBRUARY.

Nights of Feb. 23 and 24 were the coldest recorded since the first opening of Signal Office at this city—minimum thermometer registering -27. The coldest ever recorded here before was in Feb. 1875 when it was -26.—*Serg't. James A. Barwick, of Alpena, on report for Feb.*

Frost on the 2d, 4th, 5th, 14th, 19th, and 21st.—*Serg't. Geo. R. Hancock, Grand Haven, on report for Feb.*

Trees covered with rime morning of Feb. 25. The month has been stormy and quite variable in temperature, which is below the mean of several years.—*John S. Caulkins, M. D., Thornville, on report for Feb.*

Ground frozen 4 ft. deep.—*Lee S. Cobb, Winfield, on report for Feb.*

On the 19th there was a dense fog which was made up of ice crystals. The trees were encased in ice frost.—*James S. Reeves, M. D., Niles, on report for Feb.*

Frost 4 feet deep in the cemetery, soil sand and gravel.—*Francis D. Parmelee, Hillsdale, on report for Feb.*

Heavy frost morning of 20th.—*A. H. Boies, Hudson, on report for Feb.*

Thickness of ice put up in ice-houses 26 inches. Average depth of frozen earth in cemetery 3 feet.—*Edwin Stewart, M. D., Mendon, on report for Feb.*

[*Continued on page 449.*]

EXHIBIT 9.—*Comparisons of Meteorological Conditions in the Year and in each Month of the Year 1881, with Annual and Monthly Averages for 1880, and for several Stated Periods of Years,—from Observations by Prof. R. C. Kedzie, at the State Agricultural College,* near Lansing, Mich.*

METEOROLOGICAL CONDITIONS.	1881 COMPARED WITH AVERAGES FOR PREVIOUS YEARS. No. of Years Averaged, endi'g with 1880.	1881 COMPARED WITH AVERAGES FOR PREVIOUS YEARS. More (+), or Less (-), in 1881 than the Average for Previous Years.	In 1881 More (+) or Less (-), than in 1880.	METEOROLOGICAL CONDITIONS.	1881 COMPARED WITH AVERAGES FOR PREVIOUS YEARS. No. of Years Averaged, endi'g with 1880.	1881 COMPARED WITH AVERAGES FOR PREVIOUS YEARS. More (+), or Less (-), in 1881, than the Average for Previous Years.	In 1881 More (+), or Less (-), than in 1880.
YEAR 1881. *				YEAR 1881.—*Continued.*			
Av. Temp'ature	17	+2.03°	+1.41°				
Range of Tempt†	8	+3°	+6°	Rainfall..........	17	+3.64 in.	-9.23 in.
Av. Monthly Range of Tempt†..........	8	-6°	-2°	Day Ozone.....‡	9	+.27°	-0.4°
Av. Daily Range of Temp.†.....	7	-1.24°	+1.46°	Night Ozone...‡	9	+.69°	+1.03°
Cloudiness.....	17	-1 per ct	+2 per ct.	Atmospheric Pressure......	6	+.052 in.	+.071 in.
JANUARY.				FEBRUARY.			
Av. Temp.......	17	-6.10°	-20.12°	Av. Temp.......	17	-2.84°	-7.61°
Range of Tempt†	8	-13°	-7°	Range of Tempt†	8	+7°	+4°
Av. Daily Range of Temp......†	7	+2.08°	+1.23°	Av. Daily Range of Temp......†	7	+0.95°	+4.01°
Cloudiness......	17	-8 per ct.	+2 per ct.	Cloudiness......	17	+4 per ct.	+5 per ct.
Rainfall..........	17	+.53 in.	-.40 in.	Rainfall..........	17	+2.09 in.	+2.15 in.
Day Ozone.....‡	9	-.04°	+1.23°	Day Ozone.....‡	9	-1.05°	-.08°
Night Ozone...‡	9	+.12°	+2.48°	Night Ozone...‡	9	-.07°	+1.37°
Atmospheric Pressure......	6	+.019 in.	+.071 in.	Atmospheric Pressure......	6	+.126 in.	+.179 in.
MARCH.				APRIL.			
Av. Temp.......	17	-1.55°	-5.22°	Av. Temp.......	17	-.32°	-.28°
Range of Temp.†	8	-22°	-8°	Range of Tempt†	8	+12°	+18°
Av. Daily Range of Temp......†	7	-3.42°	-2.45°	Av. Daily Range of Temp......†	7	-0.55°	+2.90°
Cloudiness......	17	+3 per ct.	+11 per ct	Cloudiness......	17	-8 per ct.	+1 per ct.
Rainfall..........	17	-.03 in.	+.96 in.	Rainfall..........	17	-.92 in.	-4 67 in.
Day Ozone.....‡	9	-.29°	-1.00°	Day Ozone.....‡	9	+.53°	-.60°
Night Ozone...‡	9	+.34°	+1.06°	Night Ozone...‡	9	+1.25°	+1.14°
Atmospheric Pressure......	6	-.087 in.	-.143 in.	Atmospheric Pressure......	6	+.089 in.	+.148 in.
MAY.				JUNE			
Av. Temp.......	17	+6.74°	+.94°	Av. Temp.......	17	-3.92°	-3.29°
Range of Tempt†	8	-4°	+9°	Range of Tempt†	8	-9°	-5°
Av. Daily Range of Temp......†	7	1.15°	+1.25°	Av. Daily Range of Temp......†	7	-4.01°	-0.60°
Cloudiness......	17	-14 per ct.	-4 per ct.	Cloudiness......	17	+9 per ct.	+11 per ct
Rainfall..........	17	-.88 in.	-3.48 in.	Rainfall..........	17	+.49 in.	-.67 in.
Day Ozone.....‡	9	+.33°	+.29°	Day Ozone.....‡	9	+.73°	-.04°
Night Ozone...‡	9	+.46°	+1.23°	Night Ozone...‡	9	+2.05°	+2.10°
Atmospheric Pressure......	6	+.075 in.	+.114 in.	Atmospheric Pressure......	6	+.012 in.	+.035 in.

*For November and December, 1879, and January, 1881, the observations were made by Harry B. Turner, at the office of the State Board of Health, Lansing. The ozone observations for 1881 used in the preparation of this Exhibit were also made by Mr. Turner, at the same place.

† By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

‡ Degrees, by scale of 10 degrees of coloration of Schönbein's test-paper, exposed from 7 A. M. to 2 P. M., for the day observation: and 9 P. M. to 7 A. M., for the night observation.

EXHIBIT 9.—CONTINUED.—*Meteorological Conditions in Months for the Year 1881, Compared with Averages for Corresponding Months in Preceding Years.*

METEOROLOGICAL CONDITIONS.	1881 COMPARED WITH AVERAGES FOR PREVIOUS YEARS. No. of Years Averaged, endi'g with 1880.	1881 COMPARED WITH AVERAGES FOR PREVIOUS YEARS. More (+), or Less (-), in 1881 than the Average for Previous Years.	In 1881 More (+), or Less (-), than in 1880.	METEOROLOGICAL CONDITIONS.	1881 COMPARED WITH AVERAGES FOR PREVIOUS YEARS. No. of Years Averaged, endi'g with 1880.	1881 COMPARED WITH AVERAGES FOR PREVIOUS YEARS. More (+), or Less (-), in 1881 than the Average for Previous Years.	In 1881 More (+), or Less (-), than in 1880.
JULY.				AUGUST.			
Av. Temp.......	17	+1.52°	+5.39°	Av. Temp.......	17	+3.54°	+4.11°
Range of Temp†	8	-6°	-4°	Range of Temp†	8	-1°	+9°
Av. Daily Range of Temp......†	7	-3.06°	+1.29°	Av. Daily Range of Temp......†	7	-2.52°	+3 90°
Cloudiness......	17	-8 per ct.	-7 per ct.	Cloudiness.....	17	-3 per ct.	-12 per ct.
Rainfall..........	17	-1.62 in.	-4.46 in.	Rainfall..........	17	-1.15 in.	-4.39 in.
Day Ozone.....‡	9	+1.86°	+.84°	Day Ozone.....‡	9	+1 66°	+.48°
Night Ozone ..‡	9	+1.93°	+1.87°	Night Ozone...‡	9	+1.73°	+1.30°
Atmospheric Pressure......	6	+.053 in.	+.097 in.	Atmospheric Pressure......	6	+.072 in.	+.065 in.
SEPTEMBER.				OCTOBER.			
Av. Temp.......	17	+9.86°	+13.86°	Av. Temp.......	17	+4.55°	+6.28°
Range of Temp†	8	-4°	-4°	Range of Temp†	8	-16°	-7°
Av. Daily Range of Temp......†	7	-2.29°	+2.46°	Av. Daily Range of Temp......†	7	+0.15°	+0.74°
Cloudiness......	17	*0 per ct.	+3 per ct.	Cloudiness......	17	+9 per ct.	+15 per ct
Rainfall	17	-.10 in.	-.19 in.	Rainfall	17	+3.29 in.	+3 25 in.
Day Ozone.....‡	9	+1.40°	+1.19°	Day Ozone.....‡	9	-.64°	-.13°
Night Ozone...‡	9	+1.29°	+1.42°	Night Ozone...‡	9	+ 05°	+.84°
Atmospheric Pressure......	6	-.007 in.	+.049 in.	Atmospheric Pressure......	6	+.132 in.	+.138 in.
NOVEMBER.				DECEMBER.			
Av. Temp.......	17	+3.26°	+10.68°	Av. Temp.......	17	+9.34°	+12.24°
Range of Temp†	8	-4°	-14°	Range of Temp†	8	-12°	-20°
Av. Daily Range of Temp......†	7	+0.61°	+1 40°	Av. Daily Range of Temp ......†	7	-1 68°	+1.39°
Cloudiness......	17	+7 per ct.	+24 per ct	Cloudiness......	17	-9 per ct.	-10 per ct.
Rainfall.	17	+2.03 in.	+1.77 in.	Rainfall.........	17	-.13 in.	+ 90 in.
Day Ozone.....‡	9	-.19°	-1.23°	Day Ozone ....‡	9	-1.08°	-1 77°
Night Ozone...‡	9	+.53°	-.03°	Night Ozone...‡	9	-1.41°	-2.46°
Atmospheric Pressure......	6	+.065 in.	+.007 in.	Atmospheric Pressure......	6	+.079 in.	+.123 in.

* For November and December, 1879, and January, 1881, the observations were made by Harry B. Turner, at the office of the State Board of Health, Lansing. The ozone observations for 1881, used in the preparation of this exhibit were also made by Mr Turner, at the same place.

† By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

‡ Degrees, by scale of 10 degrees of coloration of Schönbein's test paper, exposed from 7 A. M. to 2 P. M., for the day observation; and from 9 P. M. to 7 A. M., for the night observation.

GENERAL REMARKS FROM REPORTS, ON TEMPERATURE, ETC., 1881.—CONTINUED FROM PAGE 447.

Frost mornings of February 4 and 5.—*Lansing.*

MARCH.

Frost occurred on March 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 18, 19, 23, 26, 27, and 28. Ground frozen to the depth of 18 inches.—*Serg't James J. FitzGerald, Alpena, on report for March.*

Return of birds,—robins first on 12th, and plenty by the 18th. First blue-bird seen on the 18th. Kill-deer 19th, blackbirds 28th. There is about 5 inches of snow on the ground as the month ends. Frost in the ground is not deep. The lakes and ponds are still frozen. A very wintry March.—*John S. Caulkins, M. D., Thornville, on report for March.*

Ice began to move in Grand River March 28.—*Lansing.*

First appearance of robins and song sparrows March 7th, blackbirds 8th, larks 9th. Wild geese in

great numbers flying N. W. 16th to 18th. First appearance of barn swallows 20th. Frogs singing and common striped snake seen 25th. Phœbe birds seen 26th.—*A. H. Boies, Mallory Lake, on report for March.*

March 15.—The robins put in an appearance to-day.—*Albert Yates, M. D., Washington, on report for March.*

APRIL.

Heavy white frost on April 29 and 30. Ice in bay beginning to crack in many places, will soon be gone. Navigation not yet open.—*Serg't Chas. Dill, Escanaba, on report for April.*

Frost occurred April 1, 3, 4, 5, 6, 7, 8, 9, 10, 14, 15, 17, 19, 20, 29, 30. Navigation open on 29th. Frost disappeared from ground about the 25th.—*Serg't James J. FitzGerald, Alpena, on report for April.*

Swallows came back April 10th. Plowing began 18th. Willows in blossom 26th. Apple trees budded 29th. April has been a cold, backward month, and closes with the prospect not improved. Remains of snow-drifts were seen as late as the 22d. Wheat looks bad owing to the lack of April showers.—*John S. Caulkins, M. D., Thornville, on report for April.*

Frost mornings of April 9 and 20.—*Lansing.*

Wild geese flying south April 3d. First appearance of snipe 15th. Ospreys, turkey buzzard 16th. Brown thrush, chimney and barn swallows 21st. Wild flowers in blossom 30th.—*A. H. Boies, Mallory Lake, on report for April.*

Depth of ground frozen 3½ to 4 feet. Time of disappearance of frost from the ground about the 25th.—*H. Peters, M. D., Tecumseh, on report for April.*

EXHIBIT 10.—*Depth of Wells; Depth of Ground above Water in Well; Temperature 1881, as reported by Meteorological Observers for the State*

STATIONS IN MICHIGAN.	January.			February.			March.			April.			May.		
	Depth of Well,—Ft., In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.	Depth of Well,—Ft., In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.	Depth of Well,—Ft., In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.	Depth of Well,—Ft., In. *	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.	Depth of Well,—Ft., In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.
Marquette	†	------	---	†	---	------	†	----	------	†	------	----	*9	--	37[15]
Reed City	16	10	48[20]	16	10	46[19]	16	10	45[16]	18	10	47[10]	18	10	47[16]
Thornville	20	17 11	40[14]	20	17 7	41[17]	20	17	42[16]	20	16 6	42[20]	20	16 6	45[18]
Hastings	----	------	----	--	----	------	-	---	------	7	3 3	42[24]	7	3	46[15]
Niles	----	------	----	--	----	------	--	----	------	——	------	----	--	-- -	------
Battle Creek	----	------	----	70	69 6	48	--	----	----	----	------	----	--	-- -	------
Hillsdale	27	25 4	48[15]	27	22 2	47[10]	27	20 8	48[14]	27	19 7	47[18]	27	20 5	48[16]
Mallory Lake	15	8	38[17]	15	7 6	38[16]	15	7	40[17]	15	5	38[14]	15	9	44[16]
Hudson	——	-----	----	--	----	------	--	----	----	----	------	----	.	-- -	------
Marshall	28	------	40[16]	28	----	43½[19]	28	----	48½[10]	28	------	49[16]	28	-- -	49½[15]
Mendon	19	------	50[16]	19	----	49[22]	19	----	50[20]	19	------	48[17]	19	-- -	48[15]
Kalamazoo	----	------	----	24	[illegible]	48[22]	24	5 6	49[15]	24	5	48[19]	24	2	49[18]
Park	22	10	48[18]	20	8	45[14]	22	----	46[11]	29	8	46[19]	2[illegible]	8	45[19]
Tecumseh	36	31 6	49[10]	36	31 6	49[14]	36	31 6	50[15]	36	31 6	50[14]	36	31 6	50[16]
Washington	12½	4 6	35[21]	12½	3	32[22]	12½	10	34[21]	12½	6½	33[19]	--	-- -	------

* In Lake Superior at point where observation was taken.
† No observation taken on account of lake being frozen over.

MAY.

Light frost occurred on May 3d. Navigation opened on 3d. First vessel arrived on 4th.—*Serg't Chas. Dill, Escanaba on report for May.*

Light frost occurred on May 3, 4, 7, and 16.—*Serg't James J. FitzGerald, Alpena, on report for May.*

Whippoorwills first heard on the 6th. Cherries and strawberries in blossom on 10th. Apple trees on 11th. Lilacs on 16th. Dogwood and white thorn on 24th. Locust on 26th. Wheat begun to head out on 26th. Corn planting began early—about the 12th, but has been quite generally replanted; May has been a remarkably dry, sunshiny month, but the ground water is not low. Wheat and grass are badly injured by the drought.—*John S. Caulkins, M. D., Thornville, on report for May.*

May 4, last frost.—*H. Peters, on report for May.*

JUNE.

Frost on June 6, 21, and 23.—*Serg't C. Dill, Escanaba, on report for June.*

Frost occurred on June 6, 7, 8, 9, 10, and 11.—*Serg't James J. FitzGerald, Alpena, on report for June.*

Frost on June 6, 21, 22, 24, killed corn in low places. June has been a dry, cool, sunshiny month, with very little thunder and lightning. The frost of the night following the 23d would have been severe if the sky had not clouded after midnight.—*John S. Caulkins, M. D., Thornville, on report for June.*

Frost June 10.—*Lansing.*

of Water in Well, and Day of observation of such temperature, in each month of the year Board of Health, and for the United States Signal Service.§

June.			July.			August.			September.			October.			November.			December.		
Depth of Well,—Ft., In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.	Depth of Well,—Ft., In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.	Depth of Well,—Ft. In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.	Depth of Well,—Ft., In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.	Depth of Well,—Ft. In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.	Depth of Well,—Ft., In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.	Depth of Well,—Ft., In.	Depth of Ground above Water in Well,—Ft., In.	Temp. of Water in Well,—Deg. F.
9	....	45^{15}	9	6	60^{16}	10	....	62^{15}	9 7	...	54^{28}	10	....	47^{16}	10	...	40^{18}	10 6	......	34^{16}
18	10	47^{12}	18	10	48^{18}	18	10	49^{15}	18	10	48^{14}	18	10	48^{16}	18	10	48^{15}	18	10	46^{15}
20	16 6	46^{15}	....	....	......	20	17 6	48^{15}	20	17 9	50^{16}	20	17 9	49^{17}	20	17 6	42^{16}	20	17 7	43^{19}
....	....	......	....	....	......	....	....	....	....	....	...	....	....	....	....	....	..	....	......	....
....	....	......	....	....	......	....	....	....	....	....	....	....	....	....	34	32 6	61^{15}	44	4	51^{15}
....	....	......	....	...	......	....	...	....	....	....	....	60	....	50^{14}	60	....	60^{25}	80	......	54^{26}
27	21	47^{16}	27	21 5	$47½^{15}$	29	21 5	49^{16}	....	....	....	....	....	....	....	....	....	27	16 10	49^{16}
15	6	40^{16}	15	3 6	55^{16}	....	....	....	....	....	....	....	....	....	....	....	....	....	.....	....
....	....	......	....	....	......	15	3	53^{16}	37	33	52^{16}	37	33	52^{16}	37	33	51^{16}	37	33	52^{17}
....	....	......	....	....	......	....	....	....	....	...	....	....	....	....	....	....	....	....	......	....
19	....	49^{19}	19	....	51^{18}	19	....	53^{20}	19	....	53^{15}	19	....	54^{11}	19	....	53^{16}	....	......	....
24	3	50^{14}	24	3 3	51^{16}	24	1 6	52^{15}	24	6	52^{16}	24	7 6	53^{16}	24	6	52^{14}	24	22	51^{15}
23	7	48^{17}	23	....	50^{15}	20	7	52^{11}	18	7	56^{12}	20	7	56^{19}	20	...	56^{24}	20	6	54^{18}
36	31 6	50^{15}	36	31 6	50^{16}	40	37 6	50^{14}	40	37 6	50^{15}	40	37 6	49^{15}	40	37 6	48^{21}	40	......	46^{17}
12½	3 8	51^{21}	12½	4 3	55^{19}	....	....	...	....	....	....	...	...	...	....	....	....	....	......	....

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month, on which the observation was made.

JULY.

July has been a very hot and dry month and remarkable for the persistency of N. W. winds, even during some of the hottest weather. Wheat harvest began about the 12th, the crop being something more than half an average, and secured in excellent condition. All other crops, especially corn, potatoes, and clover-seed, are badly injured by the drought.—*John S. Caulkins, M. D., Thornville, on report for July.*

AUGUST.

Light frost occurred on August 15. No damage done to vegetation.—*Serg't Chas. Dill, Escanaba, on report for August.*

August has been a dry, hot month. Vegetation has suffered from the drought beyond all record. At a short distance a pasture cannot be told from a ploughed field. With the exception of the wheat, which turns out better than was hoped, and may be estimated at half an average yield, the crops are almost a total failure, especially corn and potatoes.—*John S. Caulkins, M. D.. Thornville, on report for August.*

The driest ever known here.—*James S. Reeves, M. D., Niles, on report for August.*

SEPTEMBER.

Slight frost on Sept. 4. The migratory birds are staying longer than last year, robins and blue birds still to be seen, some yellow birds and fly-catchers; black-birds left Sept. 25.—*John S. Caulkins, Thornville, on report for Sept.*

Sept. 12, slight trace of frost on low ground in morning.—*Orrin Dean, Hudson, on report for Sept.*

OCTOBER.

Frost occurred on following dates: Light, 4, 6, 10, 23, 25. Heavy, 5, 16, 20, 24, 26.—*Serg't Chas. Dill, Escanaba, on report for October.*

Frost occurred on Oct. 2, 4, 5, 6, 10, 12, 13, 14, 18, 21, 24, 25, 26, 27.—*Serg't James J. FitzGerald, Alpena, on report for October.*

First frost on October 5.—*E. S. Richardson, M. D., Reed City, on report for October.*

Frost on Oct. 11, 19, 21, 26, 27. October has been a cloudy, wet month with a few very cold nights, no snow seen, and fair average temperature. In spite of the heavy rainfall water has not risen in the well and springs, and below the wet there is a stratum of dry earth one to two feet in thickness. Birds were seen till about the middle of the month (robins and blue birds), and wild geese went south about the same time.—*John S. Caulkins, M D., Thornville, on report for October.*

Frost (first of season) Oct. 4; Frost Oct. 5, 9, 10, 18, 20, 25, and 28 —*Lansing.*

Heavy frost October 5.—*Michigan State House of Correction, Ionia, on report for October.*

The first frosts noticed on Oct. 4, 5, 6, 19, 20, and 21. Ice formed October 19, observed at 7 A. M.—*James S. Reeves, M. D., Niles, on report for October.*

Oct 8, ice formed in places, 19th ground slightly frozen —*Francis D. Parmelee, Hillsdale, on report for November.*

First frost of the season, night of October 4.—*W. T. Drake, Marshall, on report for October.*

First appearance of wild geese Oct. 17.—*Lewis Marvill, Park, on report for October.*

First frost October 5 —*L. G. North, Tecumseh, on report for October.*

NOVEMBER.

Frost occurred on Nov. 9, 11, 13, 22, and 24 —*Serg't Chas. Dill, Escanaba, on report for November.*

Ground frozen about 3 inches. Frost occurred on Nov. 5, 6, 7, 11, 13, 14, 24, and 29.—*James J. FitzGerald, Alpena, on report for November.*

First snow November 3.—*E S. Richardson, M. D., Reed City, on report for November.*

This has been a wet, cloudy month, warmish for the season. No frost in ground at close of month.—*John S. Caulkins, M. D., Thornville, on report for November.*

First snow, Nov. 3 —*State House of Correction, Ionia, on report for November.*

Frost Nov. 6, 9, and 13. Ground froze Nov 20 and remained so until Nov. 30 —*Lansing.*

Cultivated ground frozen 1¼ to 1½ inches Nov. 18.—*Francis D. Parmelee, Hillsdale, on report for November.*

DECEMBER

Ground frozen 6 inches.—*Serg't James J. FitzGerald, Alpena, on report for December.*

December has been a warm, open month, with scarce any snow and very bad roads. There is no frost in the ground worth speaking of as the month closes. No ice in lakes and streams. Water is still low in spite of all the rains that we have had. There were six nights that it did not freeze, Dec. 13, 20, 22, 28, 28, 29, and white frosts on Dec. 8, 9. 10, 15, 18, 24.—*John S. Caulkins, M. D., Thornville, on report for January.*

Frost, ground froze Dec. 8. Frost disappeared from ground Dec. 13. River closed Dec. 10, opened Dec. 13. Frost Dec. 9, 17, 18, 23, 24, 25, and 26. Ground froze Dec. 29. River closed Dec. 31.—*Lansing.*

CONCERNING METHODS OF ASCERTAINING THE MEAN TEMPERATURE.

EXHIBIT 16.—*The Average Temperature, at Stations named, for the Months of July and December, 1881, as determined by taking for Daily Means one-third of the sum of Observations* at 7 A. M., 2 P. M., and 9 P. M., ⅓ (7 A. M., + 2 P. M., + 9 P. M. Observations), Compared with the Average Temperature for the same Months at the same Stations, as determined by taking for Daily Means one-fourth of the sum of the same Observations* added to the Observation at 9 P. M., ¼ (7 A. M., + 2 P. M., + twice 9 P. M. Observation).*

	Ann Arbor.		Detroit.*		Port Huron.*		Thornville.	
	July.	Dec.	July.	Dec.	July.	Dec.	July.	Dec.
(*a*.) By formula ⅓ (7 + 2 + 9).....	73.30	33.30	74.30	39.60	69.40	33.82	75.75	35.43
(*b*.) By formula ¼ (7 + 2 + 9 + 9).	72.90	33.20	74.00	40.20	68.79	33.70	75.08	35.22
By formula *a* Higher (+) or Lower (-) than by formula *b*..........	+.40	+.10	+.30	-.60	+.61	+.12	+.67	+.21

* The observations at Detroit were taken at 6:36 A. M., 2:36 P. M., and 10:36 P. M., and those at Port Huron at 6:38 A. M., 2:38 P. M., and 10:38 P. M., local time, or at 7 A. M., 3 P. M., and 11 P. M., Washington time.

Obviously an average of observations made every hour, or at shorter uniform intervals, would be nearer the mean temperature for the day or the month than a single observation for the day or an average of observations made but once a day for the month. At Amherst College (Mass.), observations of the temperature were made, under the direction of Prof. Snell, every hour for the year 1839. Daily, monthly, and annual averages of these observations were made, and comparisons of these averages were made, in order to determine at what hours observations could be made the average of which would be nearest the average of the hourly observations. It was found for that year (1839) that the monthly averages of observations at 8 P. M. were generally nearer the monthly averages of the observations made every hour than were the averages of observations at any other hour of the day, the variation (for the 8 P. M. observations) being, for each month, less than one degree F.; that the variation from monthly averages of the hourly observations was for the averages of observations at 9 A. M. very small (from March to Nov., inclusive, less than one degree, in Jan. and Feb. only 1.46°, and in Dec. 2.40°); for the averages of observations at 7 P. M. very small; for monthly averages of daily averages of observations at 3 A. M., 9 A. M., 3 P. M., and 9 P. M. less than half a degree; for monthly averages of daily averages of observations at 6 A. M., 2 P. M., and 10 P. M. less than half a degree; for monthly averages of daily averages of observations at 7 A. M., 2 P. M., and 11 P. M. less than half a degree. It was found also that monthly averages of daily means found by dividing the sum of the 7 A. M., 2 P. M., and twice 9 P. M. observations by four were nearer the averages of the hourly observations than were monthly averages of daily means found by dividing the sum of the 7 A. M., 2 P. M., and 9 P. M. observations by three. In the Smithsonian "Meteorological and Physical Tables" (1859) are given similar comparisons of observations at many other places. In Exhibit 16, above, comparison is made for July and December (1881) of monthly averages of daily means found by both the last stated formulæ, the observations having been made at Ann Arbor, Detroit, Port Huron, and Thornville. Except for Detroit, in December, the average of daily means found by dividing the 7 A. M. + 2 P. M. + 9 P. M. observations by 3 is higher than the average of daily means found by dividing the 7 A. M. + 2 P. M. + twice 9 P. M. observations by 4, as would be supposed,

because the temperature at 9 P. M. is generally lower than the daily mean of hourly observations; and inasmuch as the comparisons at Amherst show that even the one-fourth of the observations at 7, 2, 9, 9, was higher than the daily mean of hourly observations, except in the months of March and July, it seems probable that in Exhibit 16 the line giving results by this last-named formula is nearer correct than is the line which precedes it, computed by the other formula. The methods adopted in this Report are mostly stated in footnotes to Table I., on pages 456–7. In Exhibit 11, and generally unless otherwise noted, the computations were made by the formula $\frac{1}{3}(7+2+9)$.

EXHIBIT 11.—*Comparison of the Average Temperature during the Year and during each Month of the Year 1881, with the Annual and with the Monthly Averages for the Year 1880, and with the Averages for the Sixteen Years 1864–80. Observations made by Prof R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

YEARS, ETC.	AVERAGE (MEAN) TEMPERATURE,—DEGREES FAHR.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	*Sept.	Oct.	Nov.	Dec.
Av. for 17 yrs, 1864–80	46.70	23.08	24.42	31.83	45.91	58.50	68.23	71.91	69.15	59.83	47.96	34.94	24.97
1880	47.32	37.10	29.19	35 50	45.87	64.30	67.60	68.04	68.58	55.83	46.23	27.52	22.07
1881*	48.73	16 96	21.58	30.28	45.59	65.24	64.31	73.43	72.69	69.69	52 51	38 20	34.31
In 1881 **Higher** than Av 17 yrs,—1864–80.	2.03	......	......	......	......	6.74	......	1.52	3.54	9.86	4.55	3.26	9.34
In 1881 **Lower** than Av 17 years, 1864-80	......	6.10	2.84	1.55	.32	......	3.92	......	......	......	......	......	......
In 1881 **Higher** than in 1880	1.41	......	......	......	......	.94	......	5.39	4.11	13.86	6.28	10.68	12.24
In 1881 **Lower** than in 1880.	......	20.12	7.61	5.22	.28	......	3.29	......	......	......	......	......	......

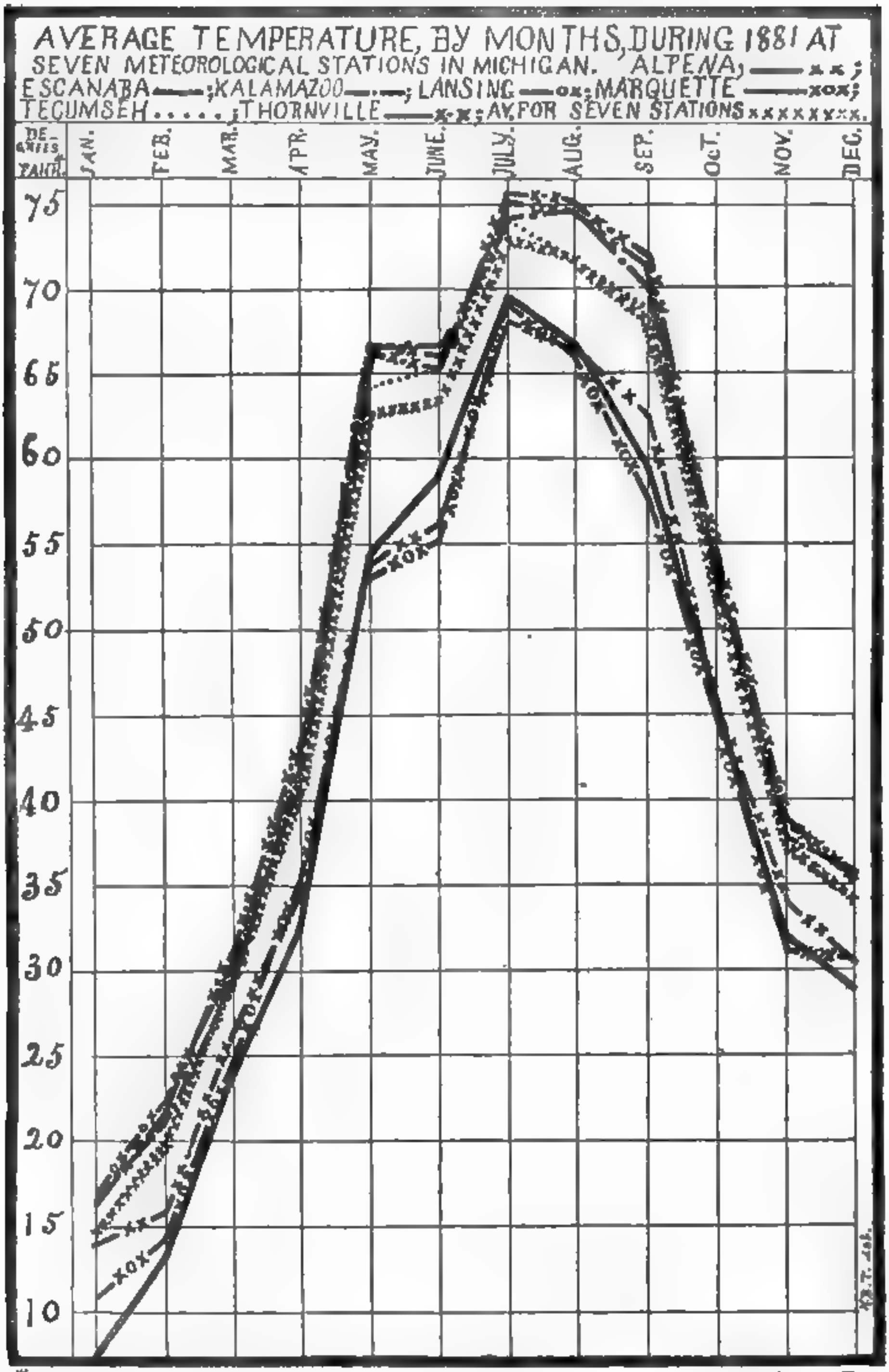
* For November and December, 1879, and for January, 1881, the observations were made by Harry B. Turner at the office of the State Board of Health, Lansing.

EXHIBIT 12.—*Average Temperature, by Year and Months, in 1881 compared with Annual and Monthly Averages for the 5 Years, 1877–1881.**

YEARS, ETC.	AVERAGE TEMPERATURE,†—DEGREES FAHR.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 years,—1877-1881	47.70	23.24	26.08	33.16	45.64	59.20	65.62	72 50	70.05	62.55	51.78	35 47	28.12
1877 — (12 Stations*)	48.67	19.18	32.27	25.92	46.71	58.24	67.48	72 80	70.52	63.80	52.78	37.57	36.73
1878 — (14 Stations*)	49.24	27.17	29.75	41.46	52.27	51.73	65.18	74.22	70.92	63 99	50.13	38.34	22.74
1879 — (19 Stations*)	46.82	20.86	20.69	33.08	44 29	58.03	64.70	73.16	68 99	57.43	57.43	36.80	28.41
1880 — (15 Stations*)†	46.55	34.06	27.93	31.00	44.39	62.27	67.41	69.39	68.07	59.54	46.69	27.21	20.67
1881 — (20 Stations*)†	47.22	14.93	19.75	29.36	40.53	62 72	63.32	72.95	71.76	67.99	51.87	37.42	34.03
In '81 **Higher** than Av '77 81	......	......	......	......	......	3.52	......	.45	1.71	5 44	.09	1.95	5.91
In '81 **Lower** than Av. '77-81	.48	8 31	6.33	2.80	5.11	......	2.30	......	......	......	......	......	......

* What stations are included in the average line for each year is stated at foot of page 471.
† Formula for daily means for 1880 and 1881, stated in * and ‡‡ footnotes, page 457.

DIAGRAM I.—TEMPERATURE BY MONTHS IN 1881.



*SCALE, 10 DEGREES TO .92 INCHES VERTICALLY. Des. by H.E.B.

TABLE I.—*Average Temperature in Degrees Fahr., for the Year, and for each Month of the Year 1881, at each of 26 Stations in Michigan, and also the Average for 20 of the Same Stations.—From observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

STATIONS IN MICHIGAN.† (Those of the U. S. Signal Service in italics.)	Division of the State.‡	Temperature, in Degrees Fahr. — Year: 1878.	1879.	1880.	1881.	Months, 1881: Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept	Oct.	Nov.	Dec.
Average for 20 Stations.§		**	††	‡‡	47.22	14.93	19.75	29.36	40.53	62.72	63.32	72.95	71.70	67.09	51.87	37.42	34.03
Marquette	U. P.	——	43.14	41.98	41.00	10.10	14.30	24.60	35.20	53.30	55.10	69.00	66.00	57.60	44.90	30.90	30.80
Escanaba	U. P.	——	——	41.88	41.12	7.60	13.20	24.00 h	32.00	54.50	59.00	69.90	66.90	59.40	45.50	32.00	28.80
Alpena	N. E.	——	42.89	42.75	42.33	14.00	15.90	26.40	34.30	54.00	56.30	68.10	66.40	62.40	46.00	33.50	30.30
Harrisville	N. E.	......	......	......	43.69	12.37	16.15	26.19	35.94	55.88	57.07	70.69	67.65	63.54	49.03	35.60	31.20
Grand Haven	W.	......	48.06	47.73	48.23	19.80	23.20	30.90	40.60	62.40	63.00	71.10	71.00	67.44	52.50	39.90	38.90
Reed City	W.	47.15	44.85	44.65	46.51	14.55	17.29	27.86	39.67	65.31	65.33	73.80	72.43	68.07	48.61	35.02	31.94
Port Huron	E. & F.	......	45.67	46.90	45.80	10.30	22.00	29.00	37.20	50.20	57.90	69.40	70.10	68.40	52.00	37.60	33.80
Thornville	E. & F.	49.09	48.11	48.76	49.62	16.32	21.37	31.49	43.47	66.39	65.10	75.75	75.10	71.89	54.20	38.90	35.48
Agricultural College‖	C.	48.29	46.88	47.28	48.73	16.98	21.58	30.28	45.59	65.24	64.31	73.48	72.69	69.69	52.51	38.20	34.31
Hastings	C.	......	......	......	a	13.03	20.27 m	20.56 g	41.30	65.09	65.95 h	74.76	......	69.85 j	52.78 h	37.37	33.08 i
Ionia	C.	......	......	......	b	16.19	17.93	27.60	40.16	65.84	......	75.18	74.80	70.20	53.35	38.26	35.55
Lansing, State Board of Health	C.	......	......	48.94	49.59	16.98	22.27	30.59	43.23	66.94	65.99	75.41	74.63	71.33	53.63	38.76	35.28
Otisville	C.	48.22	46.58	46.34	c	14.41 m	......	......	......	......	......	73.71	73.49	69.54	52.13	36.77	33.22
Winfield	C.	......	......	......	48.13	14.10	20.35	29.95	42.44	65.76	65.96	74.44	72.45	69.33	52.16	37.42	33.20
Niles	S. W.	......	......	......	49.33	16.61	21.63	31.38	42.33	65.67	66.49	74.96	74.04	70.09	51.83	35.77	35.50
Ann Arbor	S. C.	......	......	......	47.95	15.70	20.30	29.70 g	41.00	64.40	64.30	73.30 g	72.50	69.50	53.00 g	37.50	33.30
Battle Creek	S. C.	51.46	50.17	50.61	d	17.39	22.52	31.19	41.33	67.42	67.29	44.25	.....	72.91	55.23 h	41.00	37.23
Hillsdale	S. C.	......	......	......	e	14.85	19.89	29.11	41.49	65.22	65.64	73.23	72.66	......	......	37.68 h	33.55

Kalamazoo	S. C.	49.19	47.57	48.21	49.02	16.46	21.18	29.74	42.07	66.53	66.59	74.29	74.67 [g]	69.97	53.42	37.70	35.59
Mallory Lake and Hudson ¶	S. C.	....	....	....	49.64	16.30	20.01	30.32	42.59	66.53	66.50	74.61	73.18 [n]	70.92	54.92	41.77	38.02
Marshall	S. C.	....	....	....	f	15.69 [h]	17.80 [m]	32.02 [l]	44.49 [l]	......	67.30 [j]	75.30 [j]	74.55 [h]	71.05 [k]	53.57 [g]	38.59	34.95
Mendon	S. C.	48.60	47.08	47.75	48.66	15.24	20.03 [k]	30.61 [g]	42.24	66.09 [k]	66.23	73.96 [h]	72.94	69.49 [g]	53.44 [j]	38.22 [h]	35.45 [l]
Park	S. C.	....	....	....	48.50	12.49	17.96	29.39	41.40	67.30	67.82	75.04	74.45	70.62	54.35	37.73	33.46
Tecumseh	S. C.	49.43	46.59	47.75	47.87	14.85	20.17	30.05	41.19	64.31	65.36	74.00	71.68	68.67	53.06	36.99 [h]	34.15
Detroit	S. E.	49.87	48.42	48.70	51.40	17.70	26.50	34.20	44.90	64.70	65.30	74.30	74.00	72.30	57.60	44.50	40.20
Washington	S. E.	....	46.44	45.91	47.30	14.05	19.60	29.59	41.48	62.85	62.74	73.45	72.45	69.16	52.27	36.94	32.96

* At the U. S. Signal Service Stations from Jan. 1 to July 1, 1881, the observations were made at 7 A. M., 2 P. M., and 9 P. M., local time, and the daily averages from which the monthly averages were determined, were found by dividing the sum of the 7 A. M. + the 2 P. M + twice the 9 P. M. observation by four. At these stations from July 1 to the end of the year the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time, and one-third the sum of the three observations was taken as the daily average. The local time at these stations corresponding to 7 A. M., 3 P. M., and 11 P. M., Washington time, is as follows: At Port Huron, 6:38 A. M., 2:38 P. M., and 10:38 P. M.; at Detroit, 6:36 A. M., 2:36 P. M., and 10:36 P. M.; at Alpena, 6:34 A. M., 2:34 P. M., and 10:34 P. M.; at Grand Haven, 6:23 A. M., 2:23 P. M., and 10:23 P. M.; at Escanaba, 6:20 A. M., 2:20 P. M., and 10:20 P. M.; at Marquette, 6:19 A. M., 2:19 P. M., and 10:19 P. M. At the other stations the observations were made at 7 A. M., 2 P. M., and 9 P. M., local time; and the daily averages were one-third the sum of these three observations.

† The names of observers, their places of observation, and the counties in which those places are situated, are stated in Exhibit 7, page 445.

‡ The names of divisions, and the counties in each, are stated in Exhibit 1, page 287.

§ This line is an average for only the 20 stations from which statements were received for every month of the year.

‖ The average temperature stated for the Agricultural College for 1879 and 1881 includes observations made at the office of the State Board of Health, Lansing, for November and December, 1879, and January, 1881. The Agricultural College is about 3 miles east from Lansing.

¶ The observations compiled in this line were made at Mallory Lake until Aug. 1. After that date they were made by another observer with the same instruments at Hudson. Mallory Lake is 3¾ miles southwest from Hudson.

** The average for 15 stations in 1878 is 49.18°.

†† The average for 19 stations in 1879 is 46.82°.

‡‡ The daily average from which the numbers in the column for 1880 were determined, were one-fourth of (7 A. M. + 2 P. M. + twice 9 P. M. observations.) The average for 15 stations in 1880 is 46.55°.

[a] For 11 months, 45.87°.

[b] For 1 months, 46.89°. [c] For 7 months, 50.46°. [d] For 11 months, 45.65°. [e] For 10 months, 45.33°. [f] For 11 months, 47.74°.

[g], [h], [i] In the columns from January to December, inclusive, the letters g, h, i, etc., stand directly under the numbers from which they refer to the notes below.

[g] For 30 days. [h] For 29 days. [i] For 28 days. [j] For 27 days. [k] For 25 days. [l] For 22 days. [m] For 21 days.

[n] For 20 days.

The lines for 7 representative stations in Table I. are graphically represented in Diagram I. page 455. Comments on the diagrams are printed on a following page.

EXHIBIT 18.—*Comparison of the Extremes and the Range of Temperature (Degrees Fahr.) during the Year and during each month of the Year 1881, with the Average of the Extremes, and of the Range for the eight Years, 1873–80; also, Statement of the Extremes and of the Range for each of the Eight Years, 1873–80. Observations made with Registering Thermometers (except for the first two months of 1873, and for those two months with an ordinary Thermometer, at 7 A. M., 2 P. M., and 9 P. M.) Daily, by Prof. R. C. Kedzie, at the State Agricultural College,* near Lansing, Mich.*

YEAR AND MONTHS.	EXTREMES AND RANGES OF TEMPERATURE.—DEGREES F.																																
	1873.			1874.			1875.			1876.			1877.			1878.			1879.*			1880.			Average for 8 years,† 1873–80.			1881.*			In 1881 Higher (+), or Lower (-), than Av. for 8 Yrs, 1873-80.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.
YEAR	94	- 0	124	101	-7	108	94	-33	127	96	-19	115	93	-14	107	98	-7	105	97	-18	115	94	-17	111	96	-18	114	100	-17	117	+4	+1	+3
Average Month	74	15	59	77	15	62	75	10	64	74	16	58	74	20	54	73	22	51	76	15	61	74	20	54	75	17	58	74	22	52	-9	+5	-6
January	43	-30	73	59	-7	66	35	-13	48	65	6	59	52	-9	61	48	-4	52	44	-18	62	62	9	53	51	-8	59	37	-9	46	-14	-1	-13
February	49	-13	62	48	-1	49	42	-33	75	59	-1	60	56	10	46	55	-7	61	41	-6	47	59	-2	61	51	-7	58	48	-17	65	-3	-10	+7
March	57	-12	69	67	8	59	75	-11	86	60	0	60	51	-14	65	72	18	54	66	4	62	55	6	49	63	0	63	50	9	41	-13	+9	-22
April	82	24	58	68	3	65	80	0	80	74	16	58	81	18	63	75	29	46	81	12	69	76	20	56	77	15	62	83	9	74	+6	-6	+12
May	84	27	57	96	21	75	89	24	65	89	31	58	90	26	64	77	29	48	91	25	66	87	40	47	85	25	60	89	33	56	+1	+5	-4
June	94	42	52	95	34	61	89	33	56	95	42	53	89	40	49	91	36	55	95	33	62	92	41	51	93	38	55	86	40	46	-7	+2	-9
July	92	44	48	98	43	55	92	44	48	96	46	50	91	43	48	98	47	51	97	47	50	94	50	44	95	46	49	95	52	43	=	+6	-6
August	94	44	50	101	41	60	93	35	58	96	36	60	93	43	50	93	42	51	96	34	62	88	43	45	94	40	55	100	46	54	+6	+6	-1
September	89	26	63	95	30	65	94	26	68	80	36	44	85	38	47	92	31	61	85	27	58	88	30	58	89	31	58	97	43	54	+8	+12	-4
October	79	16	63	76	16	60	77	18	59	75	19	56	87	26	61	82	21	61	87	15	72	76	24	52	80	19	61	75	30	45	-5	+11	-16
November*	56	1	55	70	3	67	60	2	58	62	12	50	55	4	51	52	15	37	75	13	62*	62	-4	66	62	6	56	64	12	52	+2	+6	-4
December*	64	10	54	50	-6	56	70	-1	71	41	-19	60	58	13	45	36	-2	38	58	-3	61	47	-17	64	53	-3	56	56	12	44	+3	+15	-12

* For November and December, 1879, and January, 1881, the observations were made by Harry D. Turner, at the office of the State Board of Health, Lansing.
† For the nine years, 1873-81, the highest temperature was 101°, August 11, 1874; the lowest was -33°, February 8, 1875; and the range was 134° F.

By Table II., pages 460–1, it may be seen that a minimum temperature for the month is recorded oftener than a maximum. This may be in part because the minimum thermometers are set and recorded at a cold time of the day (7 A. M. or 11 P. M.,) so that the same cold spell appears to have a minimum in two consecutive days.

EXHIBIT 14.—*Average Daily Range of Temperature, by Year and Months in 1881, compared with Annual and Monthly Averages for the 3 Years, 1879-81.**

YEARS, ETC.	AVERAGE DAILY RANGE OF TEMPERATURE—DEGREES FAHR.												
	Ann. Av.	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 3 years, 1879-81..	17.81	16.32	17.60	16.26	19.67	21.94	19.62	19.61	19.33	18.17	17.07	14.90	12.63
1879 (6 stations*).	19.22	17.12	17.64	16.95	21.43	23.58	21.87	20.92	22.21	19.06	18.61	16.00	15.23
1880 (12 stations*)	17.03	15.55	17.47	17.46	18.15	20.86	18.61	18.50	17.97	17.69	16.37	14.52	11.26
1881 (10 stations*)	17.17	16.30	17.68	14.37	19.43	21.38	18.37	19.40	19.62	17.76	16.22	14.17	11.41
In 1881 Greater than Av. 1879-81	......	......	.08	......	......	......	......	......	......	......	......	......	......
In 1881 Less than Av. 1879-81......	.64	.02	......	1.89	.24	.56	1.25	.21	.31	.41	.85	.73	1.22

* Marquette, Grand Haven, Lansing, and Detroit for each of the 3 years, 1879-81;—also Otisville and Battle Creek for both 1879 and 1880; Escanaba, Alpena, Port Huron, Thornville and Kalamazoo for both 1880 and 1881; Adrian for 1880, and Agricultural College for 1881.

EXHIBIT 15.—*Comparison of the Average Daily Range of Temperature for the Year and for each Month of the Year 1881, with Averages for the 7 Years 1874-80 and for the Year 1880; Observations made with Registering Thermometers by Prof. R. C. Kedzie, at the State Agricultural College,* near Lansing, Michigan.*

YEARS, ETC.	AVERAGE DAILY RANGE OF TEMPERATURE,—DEGREES FAHR.												
	Ann. Av.	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 7 Yrs., 1874-80	21.76	16.57	19.23	19.58	23.68	26.50	24.81	26.61	27.58	25.02	20.46	15.96	15.13
1880................	19.06	17.42	16.17	18.61	20.23	24.10	21.40	22.26	21.16	20.27	19.87	15.17	12.06
1881................	20.52	18.65	20.18	16.16	23.13	25.35	20.80	23.56	25.06	22.73	20.61	16.57	13.45
In 1881 Greater than Av. 1874-80.	.....	2.08	.95	......	......	......	......	......	......	......	.15	.61	......
In 1881 Less than Av. 1874-80......	1.24	......	......	3.42	.55	1.15	4.01	3.06	2.52	2.29	......	......	1.68
In 1881 Greater than in 1880.....	1.46	1.23	4.01	......	2.90	1.25	......	1.29	3.90	2.46	.74	1.40	1.39
In 1881 Less than in 1880...........	......	......	......	2.45	......	......	.60	......	......	......	......	......	......

* For November and December, 1879, and January, 1881, the observations were made by Harry B. Turner, at the office of the State Board of Health, Lansing. For the years 1874-6, 1878, 1879 (except Nov. and Dec.) and 1880, the computations were made from the report of observations published in the Reports of the State Board of Agriculture for those years. For 1877 and 1881 (except Jan.) the computations were made from registers or copies of registers furnished by Dr. Kedzie.

TABLE II.—*Extremes of Temperature and days of Month on which the Highest and for the Year 1881, at each of 21 Stations in Michigan—as indicated by Daily Readings P. M., by Observers* for the State Board of Health, and for the U. S. Signal Service.*

Line Number.	STATIONS IN MICHIGAN.* (Those of the U. S. Signal Service in italics.)	Year 1881.‡ Highest	Year 1881.‡ Lowest	Year 1881.‡ Range	January. Highest	January. Lowest	February. Highest	February. Lowest	March. Highest	March. Lowest	April. Highest	April. Lowest	May. Highest	May. Lowest
1	At 21 Stations.	103°	-27°	135°	43°	-26°	54°	-27°	53°	-5	84°	-2°	94°	20°
2	*Marquette*....§	95	-26	121	32 [19,10]	-36 [14]	43 [3]	-31 [2]	47 [17]	-2 [1]	77 [13]	6 [9]	88 [26]	20 [9]
3	*Escanaba*....§	90	-26	116	29 [20]	-26 [14]	39 [20]	-21 [2]	43 [18]	-1 [1,2]	60 [21]	4 [2]	83 [24]	23 [3]
4	*Alpena*.......§	93	-27	120	30 [2,5,6,21]	-16 [14]	44 [10]	-27 [24]	42 [9]	-5 [2]	76 [24]	-2 [2]	85 [12]	26 [3]
5	Harrisville...ᵃ	92	-20	112	34 [4]	-18 [14]	42 [5]	-28 [2,24]	44 [14]	1 [2]	66 [24,25]	11 [5]	74 [12,24,26,29]	30 [2,3]
6	*Grand Haven*§	92	-9	101	39 [13]	-5 [18]	48 [6,21]	-9 [4]	45 [15]	15 [1,2]	78 [24]	15 [1,2]	82 [24]	37 [3]
7	Reed City....ᵃ	97	-26	123	39 [10]	-22 [14]	43 [10]	-26 [2]	46 [8]	6 [7]	81 [24]	13 [4]	91 [26,27]	40 [3]
8	*Port Huron*..§	97	-10	107	43 [13]	-10 [14]	51 [10]	-9 [2]	46 [9]	6 [3]	79 [24]	10 [5]	88 [12]	31 [3]
9	Thornville..§	101	-18	119	38 [12]	-12 [11,18]	47 [27]	-18 [24]	48 [14]	8 [1]	82 [24]	10 [9]	90 [26,27,29]	35 [4]
10	Ag'l College near Lans'g§	100	-17	117	¶37 [4]	-9 [11,18]	49 [22]	-17 [3]	50 [15]	9 [1]	83 [24]	9 [1]	89 [26,27,29]	33 [2]
11	Hastings.....ᵃ	....	....	....	36 [15]	-16 [14]	44 [26,27]	-24 [4]	48 [15]	13 [1]	86 [24]	12 [5]	90 [30]	43 [5]
12	Ionia........	....	....	....	35 [19]	-17 [14]	47 [9]	-24 [4]	46 [9,14,15]	9 [1]	82 [24]	13 [5]	92 [26]	44 [2,4]
13	Lansing, S. B. of Health..§	100	-12	112	37 [1]	-9 [17,18]	47 [26,27]	-12 [3]	53 [15]	10 [1]	84 [24]	9 [1]	91 [26,29,30]	36 [2]
14	Otisville.....§	....	....	....	36 [11,14]	-16 [14]	....	....	....	....	....	....	....	....
15	Winfield.....ᵉ	100	-21	121	25 [18]	-15 [18]	44 [22,26]	-21 [4]	45 [14,15]	11 [1]	[illegible] [24]	12 [2,4]	90 [26,27,29]	41 [3]
16	Niles.........ᵈ	96	-18	114	35 [30]	-13 [28]	47 [26]	-18 [4]	52 [15]	15 [7]	78 [24]	21 [5]	91 [29]	43 [3]
17	Adrian........§	....	....	....	40 [18]	-5 [6]	48 [27]	-10 [2]	52 [15]	13 [1]	80 [24]	13 [2,5]	91 [12,29]	39 [2,4]
18	Ann Arbor.§	96	-10	106	‖36 [5]	-5 [14]	‖44 [27]	-10 [2]	50 [15]	15 [4]	79 [24]	11 [1]	89 [29]	31 [3]
		....	....	....	110 [19]	....	....	....	....	....	....	....	....	....
19	Battle Creek.§	....	....	....	40 [12,13,14]	-8 [16,17,18]	55 [26,27]	-16 [3,4]	60 [27]	15 [1,2,3]	80 [24]	12 [2]	100 [26]	35 [9]
20	Hillsdale....ᵈ	....	....	....	38 [13]	-7 [6]	44 [21]	-8 [2]	45 [15]	12 [3]	83 [24]	5 [2]	87 [29]	39 [3]
21	Mallory Lake and Hudson ᵉᵉ	97	-7	104	36 [2]	-7 [11]	45 [26]	-6 [2,24]	47 [15]	14 [1]	83 [24]	14 [2,6]	94 [18]	41 [3]
22	Marshall....ᵇ§	98	-18	116	42 [2]	-11 [16]	54 [26]	-18 [4]	[illegible] [18]	10 [1]	78 [25]	5 [4]	91 [27]	30 [3]
23	Mendon.......ᵉ	94	-19	113	35 [10]	-5 [3]	48 [26]	-19 [4]	51 [15]	17 [1]	80 [24]	13 [4]	91 [27,30]	40 [3]
24	Kalamazoo...§	96	-7	103	37 [10]	-6 [13]	46 [26]	-7 [1]	50 [16]	15 [1]	83 [25]	10 [1]	93 [30]	35 [2]
25	Park..........	98	-17	115	37 [10]	-13 [6,28]	50 [20]	-17 [25]	50 [16]	10 [7]	80 [24]	0 [2]	92 [30]	43 [2,3]
26	Tecumseh....ᵃ	92	-19	111	36 [12]	-10 [11]	44 [21]	-12 [2]	43 [24]	10 [1]	77 [24]	13 [2]	88 [28,30]	39 [4]
27	*Detroit*........§	99	-5	104	37 [16]	-2 [14]	54 [10]	-5 [2]	49 [20]	15 [1]	78 [24]	16 [5]	91 [12]	36 [3]
28	Washington..ᵈ	99	-11	110	38 [13]	-11 [14]	46 [10]	-10 [2]	45 [15,24]	6 [3]	81 [24]	8 [5]	89 [12]	35 [2]

NOTE.—The small figures above and at the right of numbers denoting the degrees of temperature state the day or days of the month on which the highest or the lowest temperature occurred.

* The names of observers, etc., are stated in Exhibit 7, page 445.

‡ The line No. 1, and the three columns for the year 1881 relate only to the 21 stations from which observations were received for every month of the year.

§ Determined by daily readings of registering thermometers made and recorded at 7 A. M., for the preceding calendar day. But at Otisville the observations were recorded for the calendar day on which they were made; and at the stations of the U. S. Signal Service the registering thermometers were recorded and set each day at 11 P. M., Washington time. For stations not indicated by this mark (§), the extremes were determined from the 7 A. M., 2 P. M., and 9 P. M. observations.

he Lowest Temperature occurred. by Months of the Year 1881; also Extremes and Range of Registering Thermometers, or by Observations made Daily at 7 A. M., 2 P. M., and 9

June.		July.		August.		September.		October.		November.		December.		
Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Line Number.
90°	31°	99°	45°	101°	41°	100°	42°	76°	21°	67°	6°	60°	4°	1
82 (12,17)	31 (6)	95 (8)	45 (11)	91 (2,29)	41 (15)	80 (4)	42 (29)	72 (2)	27 (23,24)	58 (1)	8 (22)	48 (18,19)	8 (10)	2
88 (28)	35 (6)	90 (12,13)	53 (1,11)	85 (31)	42 (15)	79 (5)	43 (11,28)	70 (8)	25 (26)	52 (1)	9 (20,22,24)	43 (6)	4 (10)	3
80 (13)	34 (6)	91 (5)	53 (1)	89 (12)	45 (8,16)	92 (5)	43 (13)	68 (3,8)	26 (14,26)	60 (3)	9 (23,28)	49 (25)	10 (10)	4
81 (13)	41 (6)	93 (5)	57 (26)	91 (31)	44 (23)	92 (5,6)	45 (23)	74 (15)	27 (4,20,23)	62 (8)	8 (27)	48 (21)	8 (31)	5
79 (12,16)	46 (23)	87 (9)	57 (28)	92 (29)	53 (15)	85 (6)	50 (17)	72 (8)	35 (21)	58 (17)	20 (23,24)	49 (18)	21 (10)	6
88 (12)	47 (22)	96 (8)	53 (16)	97 (3,4)	54 (7)	94 (6)	44 (11)	71 (15)	21 (3)	61 (1)	12 (19)	49 (1)	9 (9)	7
88 (28)	42 (6)	94 (9)	52 (2)	97 (12)	48 (8)	97 (6)	46 (12,13)	78 (15)	31 (11)	60 (2)	13 (25)	54 (13)	14 (10)	8
89 (28)	39 (24)	99 (9)	48 (2)	101 (5)	47 (16,23)	100 (6)	46 (14)	78 (15)	32 (26)	63 (2)	16 (24)	56 (13)	15 (10)	9
86 (28,29)	40 (9)	95 (9)	52 (17,27,28)	100 (5)	46 (15)	97 (6)	43 (11,12)	75 (12,15)	30 (18,20)	64 (1)	12 (19,25,26)	56 (13)	12 (9)	10
86 (16,18)	50 (6,7)	92 (9)	60 (26)	-------	-------	98 (5)	50 (13)	76 (4,8,18)	28 (26)	64 (2)	4 (23,24)	59 (19)	10 (10)	11
------	------	94 (6,9)	61 (4,11)	100 (4)	52 (16)	100 (6)	51 (30)	74 (3,8)	32 (26)	64 (1)	18 (24,25)	54 (13)	20 (13)	12
88 (28)	43 (9)	97 (9)	56 (26,28)	100 (5)	49 (14,15)	99 (6)	47 (13)	77 (12)	32 (20)	67 (1)	13 (25)	57 (13)	15 (9,10)	13
------	------	100 (10)	47 (2)	105 (6)	41 (15,16)	101 (7)	40 (13)	77 (1,4)	27 (26)	65 (3)	17 (24)	57 (1)	11 (10,11)	14
85 (18,28)	50 (6)	95 (9)	60 (22,28,29)	100 (5)	54 (16)	95 (6)	48 (13)	75 (3,12)	28 (19)	60 (2,8)	12 (25)	56 (13)	10 (10)	15
88 (16,28)	51 (4)	96 (8,12)	58 (1,28,29)	96 (3,4,5,28,29)	51 (25)	96 (5,7)	51 (12,13,19)	76 (12)	38 (19)	60 (1,28)	10 (20,24)	60 (13)	7 (31)	16
89 (28)	48 (22)	95 (9)	57 (1,2)	------	------	------	------	------	------	------	------	------	------	17
86 (29)	44 (24)	93 (9)	53 (1)	98 (5)	50 (16)	95 (5,6)	44 (12)	76 (15)	31 (21)	63 (2)	13 (25)	56 (13)	13 (10)	18
------	------	------	------	------	------	------	------	------	------	------	------	------	------	
95 (18)	40 (21,22,23)	108 (9)	48 (30)	------	------	94 (5,6)	50 (13)	80 (9)	32 (11,18,20)	60 (1)	13 (24)	55 (18)	12 (9)	19
83 (16,28)	30 (6)	91 (9)	59 (27)	94 (12)	58 (15,23)	------	------	------	------	62 (2)	12 (19,24)	56 (13)	9 (31)	20
88 (28)	52 (6)	97 (6)	60 (1,26,27)	96 (5)	57 (15)	90 (6,7)	53 (14)	72 (3,17)	36 (19,21)	60 (2,8)	19 (25)	57 (13)	19 (10)	21
86 (16)	53 (6)	94 (9)	61 (25,26)	98 (5)	58 (15)	95 (6)	53 (14)	73 (3)	35 (19)	61 (1)	14 (25)	56 (13)	9 (9)	22
90 (28)	50 (6)	92 (18)	62 (18,20,22,27,28)	94 (29)	53 (13)	93 (5,6)	50 (11,12,13)	74 (12)	31 (19)	64 (1)	12 (25)	51 (12,13)	7 (31)	23
89 (16)	45 (21,23)	95 (9)	55 (1)	98 (5)	52 (14)	98 (6)	49 (10,11)	73 (12,15)	32 (13)	64 (9)	10 (24)	56 (13)	11 (31)	24
89 (16)	53 (6)	95 (9)	58 (26)	98 (30)	58 (14,15,25)	97 (6)	52 (13,18)	78 (12)	29 (19)	62 (1)	6 (25)	55 (3)	7 (10)	25
84 (28)	50 (22,23)	90 (8,9)	59 (1)	99 (12)	57 (15,16)	94 (6)	50 (14)	78 (17)	28 (20)	65 (2)	14 (24,25)	56 (13)	11 (9,10,31)	26
89 (29)	44 (23)	95 (9)	55 (1)	99 (12)	53 (15)	94 (6)	50 (12)	75 (15)	37 (26)	66 (2)	19 (24)	60 (13)	24 (10)	27
86 (28)	45 (21)	96 (9)	58 (1)	99 (5,12)	55 (21)	96 (5,6)	52 (14,19)	75 (7,15,17)	30 (27)	64 (3)	14 (25)	56 (1)	13 (10)	28

‖ Observations for Jan. and Feb. made with ordinary thermometer.

¶ For January, 1881, the observations were made by Harry B. Turner at the office of the State Board of Health, Lansing.

** The observations compiled in this line were made at Mallory Lake until Aug. 1. After that date they were made by another observer with the same instruments at Hudson. Mallory Lake is 3½ miles southwest from Hudson.

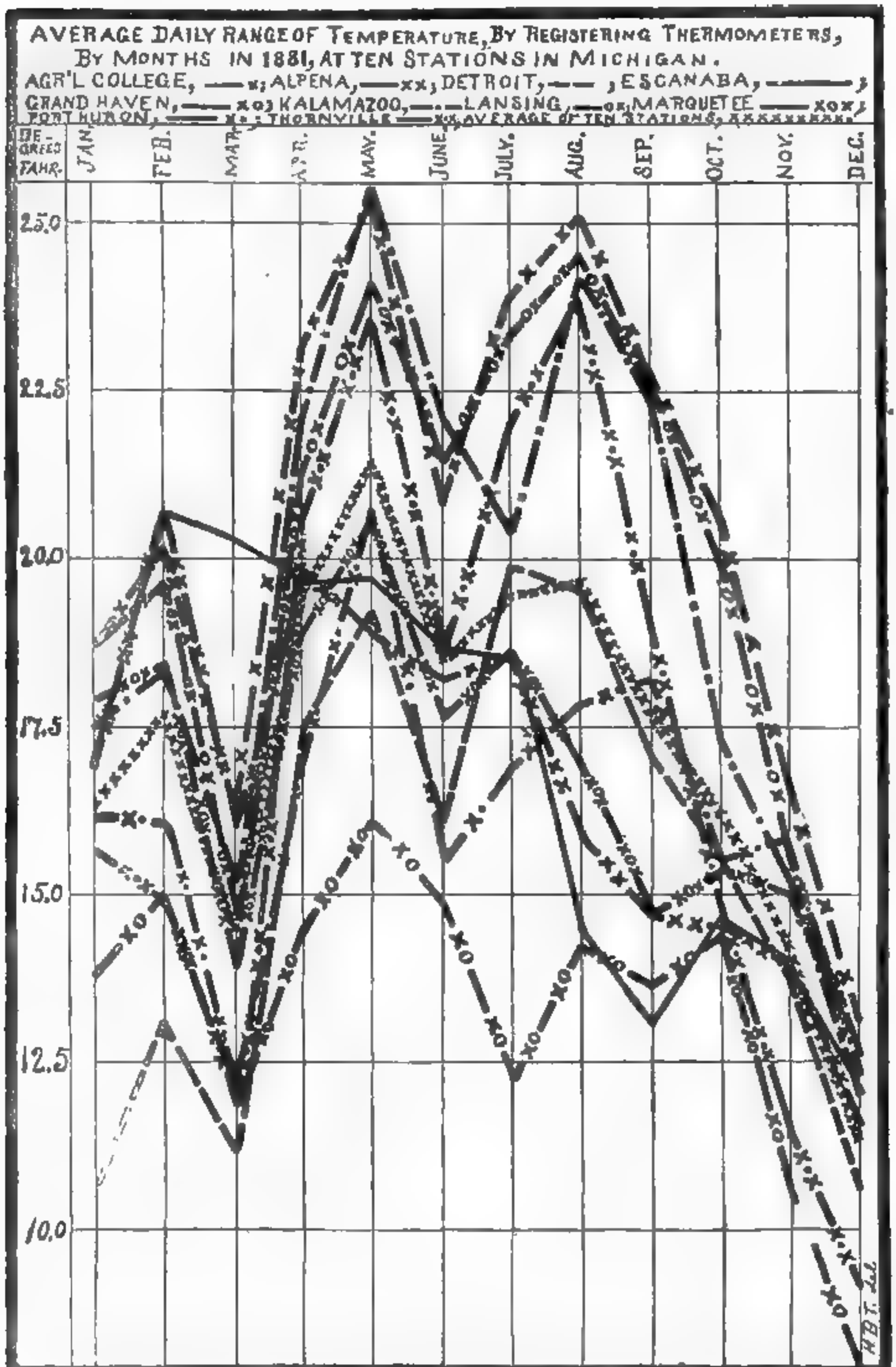
a Observations from Oct. to Dec. inclusive from registering thermometer.

b June to November inclusive by ordinary thermometer.

c Registering thermometer was used in December.

d Registering thermometer was used in November and December.

DIAGRAM II.—RANGE OF TEMPERATURE. MONTHS IN 1881.



SCALE, 5° FAHR. TO 1.8 INCH VERTICALLY. Des. by H.B.B.

TABLE III.—*Average Daily Range of Temperature, by Registering Thermometers, during the year and during each Month of the Year 1881, at each of Ten Stations in Michigan, and Average for the Ten Stations.*

STATIONS IN MICHIGAN.* (Those of the U. S. Signal Service in Italics.)	Division of the State.†	AVERAGE DAILY RANGE OF TEMPERATURE.—DEGREES FAHR. Years. 1879.	1880.	1881	Months, 1881. Jan	Feb.	Mar.	Apr	May	J'ne.	J'ly	Aug.	Sept.	Oct.	Nov	Dec.
Av. for 10 stations...	....	‡	§	17.17	16.30	17.68	14.37	19 48	21.38	18.37	19.40	19.82	17 78	16 22	14.17	11.41
Marquette....	U. P.	17.99	19.14	16.71	17.00	18.89	13.94	16.93	20.62	17.60	16.56	16.94	14.76	15.20	15.03	12.71
Escanaba	U. P.	......	16.13	16.62	17.00	20 57	29 53[a]	19.27	19 65	18.55	[illegible]	14 37	12.96	14.56	13.95	12.00
Alpena	N. E.	......	16.13	16.62	16 90	20 66	16 00	19 93	18.65	18.20	16.49	15.64	14 56	14 50	13 90	11.61
Grand Haven	W	13.75	13 98	13.26	13.64	14.96	11.97	14.47	16 10	14.50	12.18	14.16	13 63	14.38	10 62	7 95
Port Huron .	B & E.	......	16.18	16 18	16 23	16.07	12.16	17.00	20.72	15.48	16.91	17 73	18.21	15 53	15.75	12.81
Thornville ..	B. & E.	....	15 08	17.11	13.71	14 69	11.81	20.63	23.48	18 63	22.03	23.84	18 83	14 71	11.40	9 23
Ag'l College, near Lans'g	C.	....	.....	20.54	18.65[¶]	20.18	16.16	23.18	25 85	20.30	23.67	25.06	22.73	20 61	16.57	13.13
Lansing, S. B. of H.	C	20.83	18.61	19.84	18.63	19.61	14 68	21.33	26.10	21.41	23.82	24 48	22.53	19.84	15.57	12.55
Kalamazoo...	S	....	18.42	19.35	17.47	18.30[b]	15.21	22.10	25.60	22.13	20 37	24.18	22.32	17.34	15 17	12.00
Detroit..	S. E.	16.69	15.07	15 33	10 61	13.11	11.23	17.47	19.39	16 14	19.79	19.52	16.96	15.45	13.71	10 58

NOTE.—Graphic representations of statements in Table III, are given in Diagram No II, page 462.

* The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 7, page 445. † For counties in each division, see Exhibit 1, page 287.

‡ The average for the six stations in 1879 is 19.22°

§ The average for the twelve stations in 1880 is 17 03°

¶ For January, 1881, the observations were made by Harry B. Turner, at the office of the State Board of Health, Lansing

[a] At Escanaba, for 30 days. [b] At Kalamazoo, for 27 days.

EXHIBIT 17.—*Average Absolute Humidity, by Year and Months, in 1881 compared with Annual and Monthly Averages for the five Years, 1877–1881.**

YEARS, ETC.	ABSOLUTE HUMIDITY—GRAINS OF VAPOR IN A CUBIC FOOT OF AIR. Ann. Av.	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct	Nov.	Dec.
Av., 5 yrs., 1877-81	3 59	1.51	1.60	1.95	2.85	4.23	5.31	6.42	6.03	5 14	[illegible]	2 29	1.65
1877 (9 stations*).	3.71	1.37	1.87	1.61	2 83	4 10	5.67	6.33	6.24	5 37	4 08	2.43	[illegible]
1878 (12 stations*)	3.81	1.73	1.83	2.79	3.08	3.86	5.26	7.14	6.87	5 44	[illegible]	2.47	1.64
1879 (16 stations*)	3.43	1.31	1.23	[illegible]	2.64	3 94	6.09	6.30	5 58	[illegible]	4 61	2.46	1.70
1880 (14 stations*)	3 44	2 13	1.68	1.70	2.69	4.56	5.57	6.00	5.97	4.74	3 18	1.70	1.32
1881 (17 stations*)	3.54	1.02	[illegible]	1.73	2.41	4.66	4.98	6.23	5.97	5.73	3.93	2.38	2.10
In 1881 Greater than Av., 1877-81	......	......	......	......	......	.43	......	......	......	[illegible]	.05	.09	.25
In 1881 Less than Av., 1877-81......	.05	.49	.32	.23	.44	......	.33	.19	.06	......	......	......	......

* Thornville, Kalamazoo, Mendon, and Detroit for each of the 5 years 1877-81,—also Tecumseh for the 4 years 1878-81; Battle Creek and Woodmere Cemetery (near Detroit) for 3 years 1877-80; Otisville for the 3 years 1878-80; Marquette, Alpena, Grand Haven, Port Huron, and Lansing, for the 3 years 1879-81; Agricultural College for 1877, 1878, 1881; Niles for 1878, 1879, 1881; Nirvana for 1878, 1879 and first 4 months of 1880; Reed City for last 8 months of 1880 and for 1881; Benton Harbor and Coldwater for 1877, 1878; Escanaba and Washington for 1880 and 1881; Petoskey for 1879, Winfield and Ann Arbor for 1881.

TABLE IV.—ABSOLUTE HUMIDITY.—*The Average Number of Grains of Vapor of Water in a Cubic Foot of Air for Months and Year 1881, at 27 Stations in Michigan.—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

STATIONS IN MICHIGAN † (Those of U. S. Signal Service in italics.)	Division of the State.‡	Grains of Vapor in a Cubic Foot of Air.—(Absolute Humidity.) Years.				Months, 1881.											
		1878.	1879.	1880.	1881.	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 17 Stations §	....	a	b	c	3.54	1.02	1.38	1.73	2.41	4.66	4.98	6.23	5.97	5.73	3.93	2.38	2.10
Marquette	U. P.	......	2.90	2.79	2.79	0.77	0.89	1.31	1.80	3.53	3.82	5.18	5.45	4.57	2.84	1.81	1.56
Escanaba	U. P.	......	......	2.91	3.06	0.70	0.99	e 1.39	1.81	3.92	4.35	5.66	5.98	4.94	3.16	2.02	1.76
Alpena	N. E.	......	2.93	3.03	3.03	0.88	1.13	1.55	1.90	3.92	3.07	5.43	5.53	5.15	3.18	2.01	1.70
Harrisville	N. E.	......	......	......	(3.81)‖	......	......	1.12	1.64	3.83	3.70	5.49	5.65	g 5.28	3.10	1.86	1.40
Grand Haven	W.	......	3.48	3.76	3.67	1.16	1.51	1.85	2.51	4.60	4.98	6.37	6.22	5.97	4.05	2.51	2.31
Reed City	W.	3.40	3.13	3.11	3.15	0.58	l 0.91	1.17	2.02	4.51	4.70	5.67	5.76	5.40	3.39	2.04	1.64
Port Huron	B. & E.	......	3.23	3.41	3.48	1.08	1.45	1.73	2.22	4.28	4.53	5.91	5.84	5.89	3.98	2.53	2.27
Thornville	B. & E.	3.97	3.76	3.92	3.86	1.87	1.66	2.02	2.68	5.20	5.30	6.55	6.17	6.19	4.26	2.60	2.33
Agricultural College, near Lansing	C.	3.69	......	3.62	3.73	1.08	1.66	1.93	2.65	5.21	5.40	6.65	6.09	5.86	4.13	2.47	2.22
Hastings	C.	......	......	......	(3.62)‖	i 1.12	q 1.71	d 1.89	2.76	5.24	5.64	e 6.75	......	h 6.01	4.02	2.54	f 2.00
Ionia	C.	......	......	......	(3.70)‖	1.23	k 1.45	d 1.49	2.67	5.65	......	7.11	7.07	6.87	3.88	1.99	1.76
Lansing, State Board of Health	C.	......	3.44	3.49	3.54	1.08	1.40	1.76	2.49	4.84	5.07	6.08	5.80	5.59	3.94	2.37	2.10
Otisville	C.	3.76	3.50	3.72	(3.89)‖	l 1.28	......	......	......	......	......	5.98	5.55	5.67	4.08	2.50	2.15
Winfield	C.	......	......	......	3.83	1.01	1.45	1.84	2.76	5.13	5.54	6.74	6.33	6.19	4.26	2.59	2.15
Niles	S. W.	4.02	3.88	......	3.90	0.96	1.30	2.00	2.82	5.22	5.85	7.01	6.29	6.09	4.40	2.50	2.23
Adrian	S. C.	......	......	......	(3.81)‖	1.25	1.57	1.99	2.86	e 5.63	6.05	7.29	......	......	......	......	......
Ann Arbor	S. C.	......	......	......	3.63	1.13	1.43	1.74	2.43	4.81	j 5.06	e 6.30	5.90	5.83	4.14	h 2.51	g 2.27
Battle Creek	S. C.	3.67	3.67	......	(3.50)‖	0.90	1.29	1.67	2.96	5.21	5.25	6.41	......	5.83	4.21	2.61	2.14

Hillsdale	S. C.	......	......	......	(3.33)‖	0.97	1.29	1.58	2.40	4.77	5.43	6.51	6.00	......	......	2.36	1.99
Kalamazoo	S. C.	3.62	3.44	3.65	3.56	0.98	1.87	1.59	2.47	4.71	4.38	6.38	5.73	5.70	4.11	2.33	2.00
Mallory Lake and Hudson¶	S. C.	......	......	......	(4.45)‖	......	......	2.04	2.99	5.41	5.84	6.73	[p] 6.41	6.09	4.26	2.52	2.22
Marshall	S. C.	......	......	......	(3.73)‖	[d] 1.11	[m] 1.59	[n] 1.94	[o] 2.89	......	[l] 5.73	[l] 6.64	[l] 6.07	[l] 6.05	4.17	2.56	2.33
Mendon	S. C.	3.78	3.60	3.80	3.84	[e] 1.27	[k] 1.58	1.87	2.75	[j] 4.93	[h] 5.60	6.85	[d] 6.02	6.09	[e] 4.32	2.51	[f] 2.28
Park	S. C.	......	......	......	(4.99)‖	......	......	......	......	5.14	5.88	6.92	6.29	6.24	4.46	2.70	2.28
Tecumseh	S. C.	3.87	3.47	3.68	3.76	0.94	1.88	1.85	2.56	4.88	5.48	6.83	6.27	6.02	4.24	2.46	2.24
Detroit	S. E.	3.34	3.48	3.57	3.74	1.05	1.64	1.99	2.58	4.70	4.76	6.23	6.08	6.14	4.36	2.75	2.54
Washington	S. E.	......	......	3.55	3.61	1.22	1.54	1.86	2.50	4.79	4.95	6.15	5.95	5.79	4.04	2.43	2.10

* At the U. S. Signal Service Stations for the last half of the year the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The local time corresponding to these hours is as follows: At Port Huron 6:38 A. M., 2:38 P. M., and 10:38 P. M.; at Detroit 6:36 A. M., 2:36 P. M., and 10:36 P. M.; at Alpena 6:34 A. M., 2:34 P. M., and 10:34 P. M.; at Grand Haven 6:23 A. M., 2:23 P. M., and 10:23 P. M.; at Escanaba 6:20 A. M., 2:20 P. M., and 10:20 P. M.; at Marquette 6:19 A. M., 2:19 P. M., and 10:19 P. M.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 7, page 445.

‡ The full names of the divisions and the counties in each division are stated in Exhibit 1, page 287.

§ This line is an average for only the stations for which statements are given for every month of the year.

‖ An average not for the year but for the months in 1881 represented in this line

¶ The observations compiled in this line were made at Mallory Lake until Aug. 1, after that date they were made by another observer, with the same instruments, at Hudson. Mallory Lake is two miles west and one and one-half miles south from Hudson.

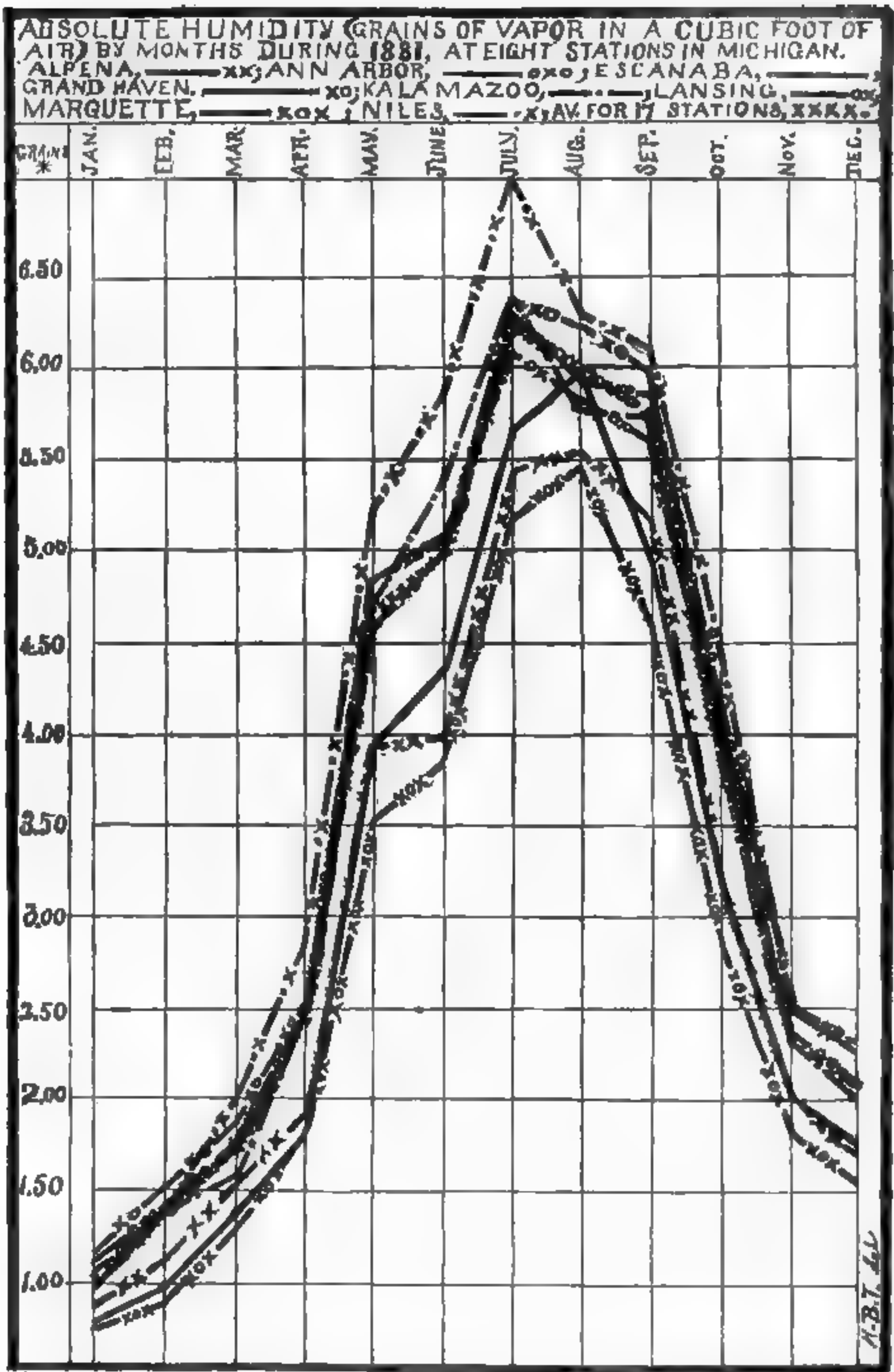
[a] The average for 12 stations in 1878 is 3.81 grains. [b] The average for 16 stations in 1879 is 3.43 grains. [c] The average for 14 stations in 1880 is 3.44 grains.

[d] For 90 observations. [e] For 89 observations. [f] For 88 observations. [g] For 87 observations. [h] For 86 observations.
[i] For 85 observations. [j] For 84 observations. [k] For 81 observations. [l] For 79 observations. [m] For 77 observations.
[n] For 76 observations. [o] For 74 observations. [p] For 65 observations. [q] For 63 observations.

NOTE.—The number of grains of vapor in a cubic foot of air at each observation was determined from readings of the psychrometer by means of Glaisher's table, Table XII. of the Smithsonian Meteorological and Physical Tables (1859.)

The lines for 17 stations in Table IV. are graphically represented in Diagrams III. and IV., pages 466 and 467.

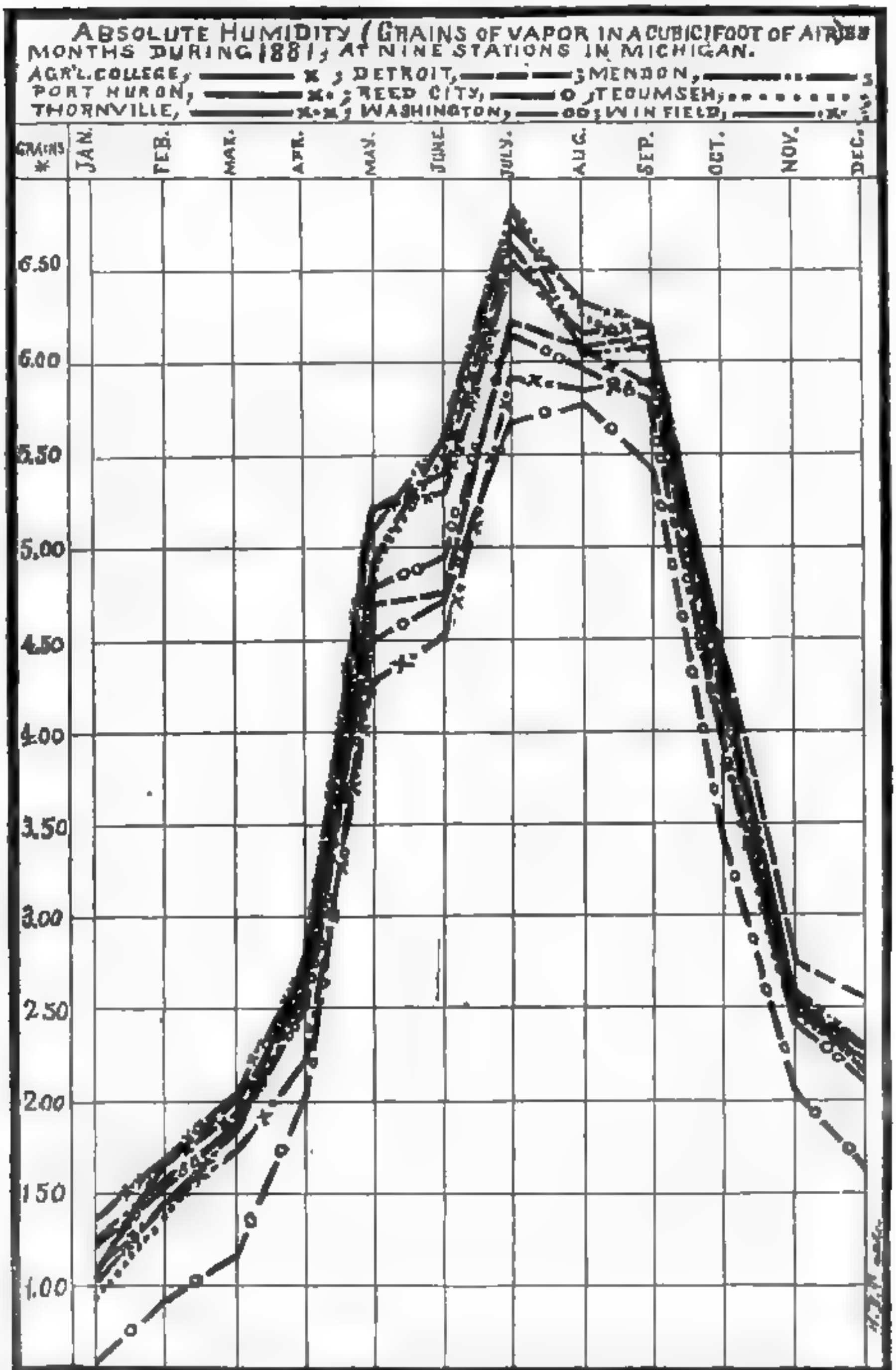
DIGARAM III.—ABSOLUTE HUMIDITY, BY MONTHS, IN 1881.



* SCALE; ONE GRAIN OF VAPOR (IN A CUBIC FOOT OF AIR) TO .98 INCH VERTICALLY

Boston Photo Eng. Co. DES. BY H.B.B.

DIAGRAM IV.—ABSOLUTE HUMIDITY, BY MONTHS, IN 1881.



* SCALE, ONE GRAIN OF VAPOR (IN A CUBIC FOOT OF AIR) TO .08 INCH VERTICALLY.

Boston Photo-Eng. Co. DES. BY H.B.B.

TABLE V.—Relative Humidity.—*Average Per Cent of Saturation of the Atmosphere with Vapor of Water during the Year, and during each Month of the Year 1881, at 27 Stations in Michigan,—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

STATIONS IN MICHIGAN.† (Those of the U. S. Signal Service in italics.)	Division of the State.†	Per Cent of Saturation,—Relative Humidity. Years. 1878.	1879.	1880.	1881.	Months, 1881. Jan.	Feb.	M'ch.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 17 stations‡	....	[a]	[b]	[c]	75	79	81	79	66	67	72	69	69	74	80	79	80
Marquette	U. P.	....	68	68	69	68	66	[illegible]	58	67	69	63	74	86	70	78	66
Escanaba	U. P.	....	....	70	77	79	79	[e]73	60	71	70	68	78	82	79	82	83
Alpena	N. E.	....	72	75	75	75	77	81	69	74	69	68	76	78	78	74	78
Harrisville	N. E.	...	....	..	(62)§	...	...	56	51	65	60	64	79	[g]70	64	63	59
Grand Haven	W.	...	72	76	78	81	83	81	72	65	73	74	74	76	82	76	78
Reed City	W.	74	70	66	62	48	[i]50	54	62	60	62	[illegible]	64	72	76	72	67
Port Huron	B. & E.	....	72	73	78	81	80	82	78	74	76	72	69	71	81	83	86
Thornville	B. & E.	81	79	80	78	96	91	85	70	67	72	66	65	72	81	82	84
Agl. College	C.	78	78	75	79	81	93	88	71	71	78	73	70	73	84	79	84
Hastings	C.	...	....	...	(77)§	[i]93	[d]87	[d]85	73	67	71	[e]69	...	[h]72	[illegible]	82	[f]78
Ionia	C.	...	....	...	(74)§	92	[k]86	[d]75	78	73	....	72	75	75	71	84	86
Lansing	C.	....	70	68	70	81	80	76	64	61	67	62	69	65	75	74	75
Otisville	C.	81	78	80	(78)§	[j]96	...	....	....	...	..	64	69	71	83	85	87
Windfield	C.	....	...	...	79	81	85	83	73	69	76	79	74	77	87	86	85
Niles	S. W.	79	77	...	77	72	76	86	76	69	79	74	69	76	84	77	81
Adrian	S. C.	....	....	...	(70)§	91	90	83	71	[e]71	77	72	...	....	....	....	....
Ann Arbor	S. C.	....	....	...	76	85	84	80	84	60	[j]71	[e]65	67	72	81	[h]82	[g]87
Battle Creek	S. C.	69	70	...	(68)§	66	68	69	72	64	66	69	...	62	78	75	66
Hillsdale	S. C.	..	..	...	(72)§	76	77	75	65	62	74	71	87	....	....	76	76
Kalamazoo	S. C.	75	72	72	71	77	80	73	68	59	71	67	60	69	79	75	75
Mallory Lake & Hudson¶	S. C.	....	....	...	(71)§	....	....	90	81	71	79	71	[p]72	73	81	75	79
Marshall	S. C.	....	....	...	(77)§	[d]83	[m]85	[n]83	[o]72	...	[l]78	[l]69	[l]63	[l]71	81	81	67
Mendon	S. C.	78	78	78	79	[e]93	[k]91	83	75	[j]63	[h]76	76	[d]67	75	[e]85	81	[f]83
Park	S. C.	....	....	....	(77)§	....	...	..	....	66	76	72	69	75	85	89	86
Tecumseh	S. C.	80	75	75	78	76	81	83	78	63	75	73	73	78	85	83	86
Detroit	S. E.	71	70	72	70	77	78	75	62	62	66	64	[illegible]	69	73	69	77
Washington	S. E.	....	....	78	78	94	93	84	69	70	73	67	68	71	82	82	84

* At the stations of the U. S. Signal Service, for the last six months of the year, the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table IV., page 465.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 7, page 445. The full names of the divisions and the counties in each division are stated in Exhibit 1, page 287.

‡ This line is an average for only the stations for which statements are given for every month of the year.

§ An average, not for the year, but for the months in 1881 represented in this line.

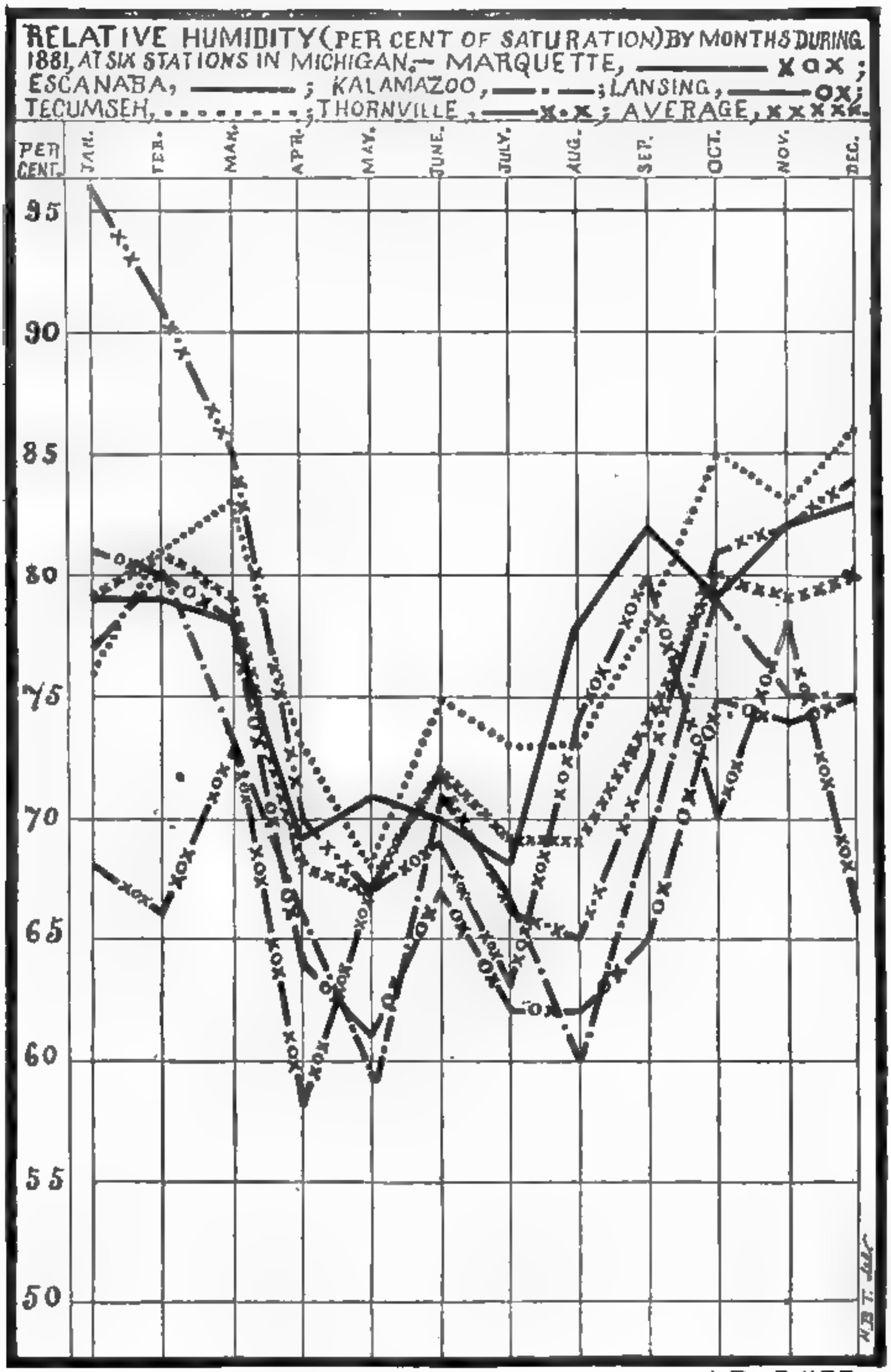
¶ The observations compiled in this line were made at Mallory Lake until August 1; after that date they were made by another observer, with the same instruments, at Hudson. Mallory Lake is two miles west and one and one half miles south from Hudson.

‖ Computed for all Signal Service stations (except Escanaba) for the last six months of the year by means of tables in "Signal Service Order No. 41" (1881), for these stations for the first six months of the year, and for all other stations for the whole year, the computations were made by means of a table issued by the Chief Signal Officer, U. S. A., nearly identical with Guyot's table in "Smithsonian Meteorological and Physical Tables," 1859.

[a] The average for 12 stations in 1878 is 74. [b] The average for 16 stations in 1879 is 74. [c] The average for 14 stations in 1880 is 73. [d] For 90 observations. [e] For 89 observations. [f] For 88 observations. [g] For 87 observations. [h] For 86 observations. [i] For 85 observations. [j] For 84 observations. [k] For 81 observations. [l] For 79 observations. [m] For 77 observations. [n] For 78 observations. [o] For 74 observations. [p] For 65 observations. [q] For 63 observations.

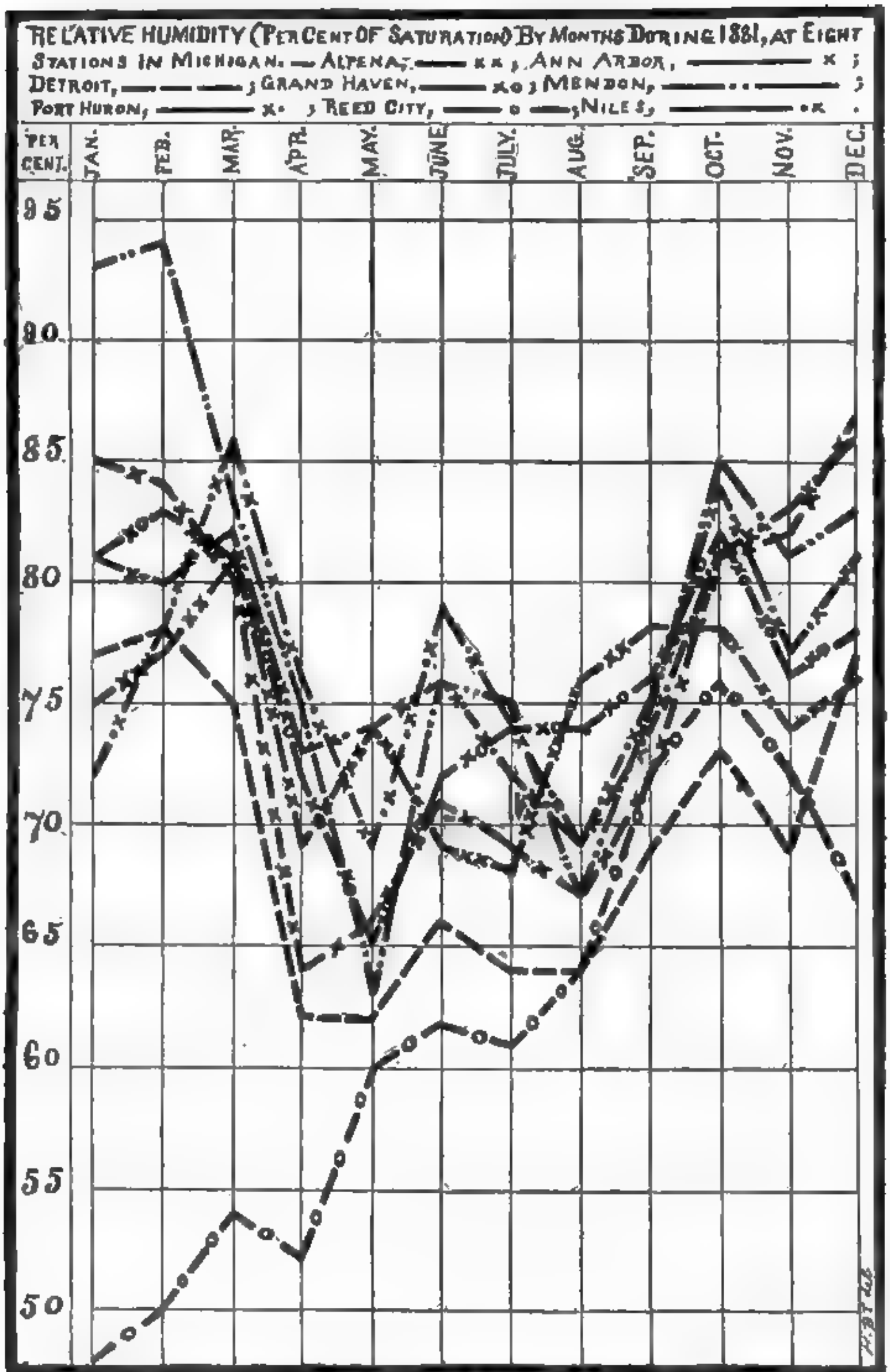
Graphic representations of 14 representative lines in this table are given in Diagrams V. and VI., pages 469 and 470.

DIAGRAM V.—RELATIVE HUMIDITY, BY MONTHS IN 1881



SCALE, 10 PER CENT OF SATURATION TO 1.3 IN VERTICALLY. DES. BY H.B.B.

DIAGRAM VI.—RELATIVE HUMIDITY, BY MONTHS IN 1881.



SCALE, 10 PER CENT OF SATURATION TO 1.3 IN. VERTICALLY. Del. by H.B.B.

EXHIBIT 18.—*Average Relative Humidity, by Year and Months, in 1881, compared with Annual and Monthly Averages for the 4 Years, 1878-1881.**

YEARS, ETC.	PER CENT OF SATURATION,—RELATIVE HUMIDITY.												
	Ann. Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 4 years, 1878-81	75	81	79	76	68	66	71	72	72	75	76	79	83
1878 (11 Stations*)	77	83	80	79	71	69	71	76	74	76	75	79	86
1879 (16 Stations*)	74	82	80	75	66	63	70	70	70	76	74	80	83
1880 (14 Stations*)	73	79	75	70	67	65	70	74	75	74	75	77	81
1881 (17 Stations*)	75	79	81	79	68	67	72	69	69	74	80	79	80
In 1881 Greater than Av '78-'81.	0	......	2	3	0	1	1	......	......	......	4	0	......
In 1881 Less than Av. 1878-81	0	2	......	......	0	......	......	3	3	1	......	0	3

*Thornville, Kalamazoo, Mendon, Tecumseh, and Detroit for the 4 years 1878-81; also Otisville and Nirvana and Reed City for 3 years 1878-80; Niles for 1878, 1879, 1881; Marquette, Alpena, Grand Haven, Port Huron and Lansing for 3 years, 1879-81; Battle Creek and Woodmere Cemetery for 1878, 1879; Agricultural College for 1878, 1881; Escanaba and Washington for 1880, 1881; Coldwater for 1878; Petoskey for 1879; Reed City, Winfield, Ann Arbor, and Hudson and Mallory Lake for 1881.

CLOUDINESS.

In the following statement are named for each month the days of the month clear ("all or nearly all sunshine,") and the days "all or nearly all cloudy," as observed by John S. Caulkins, M. D., at Thornville, Michigan. There is also stated for each month the number of clear and the number of cloudy days.

JAN.—Clear, Jan. 1, 2, 8, 10, 14, 17, 19, 20, 27, and 28—10 days. Cloudy, Jan. 3, 4, 5, 6, 7, 9, 11, 12, 13, 15, 16, 21, 22, 23, 24, 25, 26, 29, 30, and 31—20 days. *No violent winds.*

FEB.—Clear, Feb. 2, 3, 4, 5, 6, 7, 14, 17, 19, 21, 22, 23, and 25—13 days. Cloudy, Feb. 1, 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 24, 27, and 28—14 days.

MARCH.—Clear, March 1, 6, 7, 9, 10, 11, 15, 17, 18, 24, 25, 26, 27, and 28—14 days. Cloudy, March 3, 4, 5, 8, 12, 13, 14, 16, 19, 20, 21, 22, 29, 30, and 31—15 days.

APRIL.—Clear, April 7, 8, 9, 10, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 26, 29, and 30—17 days. Cloudy, April 1, 3 12, and 25—4 days.

MAY.—Clear, May 2, 3, 4, 6, 7, 8, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, and 29—24 days. Cloudy—May 1, 5, 10, 15, and 31—5 days.

JUNE.—Clear, June 2, 4, 6, 10, 11, 12, 13, 14, 15, 17, 19, 21, 22, 23, 24, 28, and 29—17 days. Cloudy, June 3, 5, 7, 8, 16, and 27—6 days.

JULY.—Clear, July 1, 2, 4, 5, 6, 9, 10, 11, 13, 15, 17, 18, 19, 21, 23, 24, 25, 27, 28, 29, 30, and 31—22 days. Cloudy, July 20 and 26—2 days.

AUG.—Clear, Aug. 1, 2, 3, 4, 5, 7, 9, 10, 12, 13, 14, 15, 16, 21, 22, 23, 24, 25, 26, 28, 29, and 30—22 days. Cloudy, Aug. 6, 18, and 19—3 days. Fires have been very destructive in forests, swamps, and marshes. Some of the time smoke so dense as to injure the eyes.

SEPT.—Clear, Sept. 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 18, 19, 20, 21, 22, 24, 25, and 29—19 days. Cloudy, Sept. 15, 16, and 30—3 days.

NOTE.—The stations represented in the lines for average temperature for the years 1877-81, in Exhibit 12, page 454, are the following: Thornville, Kalamazoo, Mendon, Tecumseh, and Detroit for each of the 5 years 1877-81,—also Battle Creek for the 4 years 1877-80; Nirvana for 1877-9, and for the first 4 months of 1880; Reed City for the last 8 months of 1880, and for 1881; Coldwater, Ypsilanti, and Woodmere Cemetery (near Detroit) for 1877-9; Otisville for 1878-80; Niles for 1878, 1879, 1881; Marquette, Alpena, Grand Haven, Port Huron, Lansing, and Washington for 1879-81; Benton Harbor for 1877-78; Agricultural College (near Lansing) for 1877, 1881; Petoskey for 1878-9; Escanaba for 1880-1; Harrisville, Winfield, Ann Arbor, Park, and Hudson and Mallory Lake for 1881. For Detroit for 1877 and 1878, for all stations for 1880, and for the U. S. Signal Service stations for the first six months of 1881, the daily means were found by the formula ¼ (7 A. M. + 2 P. M. + 9 P. M. + 9 P. M. observations); for the U. S. Signal Service stations for the last six months of 1881 they were found by formula ⅓ (7 A. M. + 3 P. M. + 11 P. M. observations, Washington time); in other cases they were found by formula ⅓ (7 A. M. + 2 P. M. + 9 P. M. observations.)

OCT.—Clear, Oct. 5, 6, 9, 10, 11, 19, 21, 22, 25, and 26—10 days. Cloudy, 1, 2, 8, 12, 13, 14, 15, 16, 17, 18, 20, 23, 24, 28, 29, 30, and 31—17 days.

NOV.—Clear, Nov 4, 6, 9, 10, and 28—5 days. Cloudy, Nov. 2, 3, 5, 7, 11, 13, 14, 15, 17, 18, 19, 25, 26, 27, 29, and 30—16 days. The cloudiness prevented the meteor storms from being observed.

DEC.—Clear, Dec 18, 23, 24, and 29—4 days. Cloudy, Dec. 1, 2, 3, 5, 6, 7, 8, 11, 12, 13, 20, 21, 22, 26, 27, 28, 30, and 31—18 days.

FOGS.

For the year 1881 fog was reported at 219 observations in the morning, at 42 afternoon observations (at about 2 P. M.), and at 47 evening observations (at about 9 P. M.), in many cases the same fog, or fog at the same time, being reported by different observers. Fog was reported, at one or more stations, at some time during the day, on 123 days, as follows: on 106 days in the morning; on 34 days at about 2 P. M.; and on 37 days at night.

EXHIBIT 21.—*Number of Different Days on which Fog was Observed at One or More of 18 Stations in Michigan in 1881, and in each Month of the Year 1881.**

Year. 1881.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
123	8	11	10	4	18	6	9	21	14	14	1	7

*This Exhibit contains statements only for those localities from which reports were received for every month of the year, as follows: Marquette, Escanaba, Alpena, Grand Haven, Reed City, Port Huron, Thornville, Agricultural College near Lansing, Lansing, Winfield, Niles, Ann Arbor, Kalamazoo, Mendon, Park, Tecumseh, Detroit, and Washington.

EXHIBIT 22.—*Number of Observations at which Fog was Observed in Michigan in 1881, and in each Month of the Year 1881. (Observations taken 3 times Daily at 20 Stations.)**

Year 1881.	Jan.	Feb.	March.	April	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
332	39	30	27	7	52	10	17	39	56	26	2	27

*This Exhibit contains statements only for those localities from which registers were received for every month of the year, as stated in foot-note for Exhibit 21.

DIAGRAM IX., ON FOGS IN 1881.

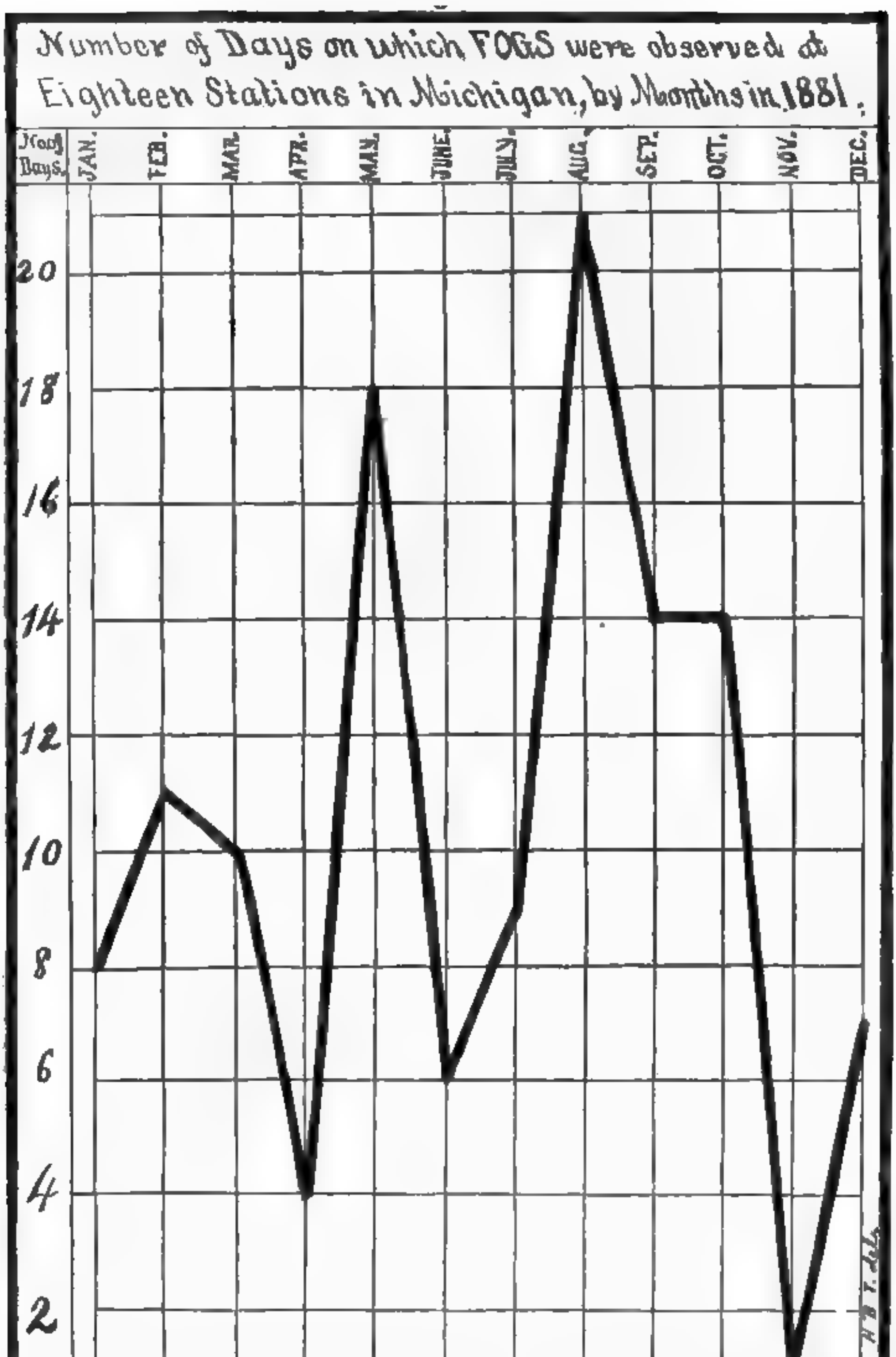


EXHIBIT 23.—*Number of different Days on which Fog was Recorded in 1881; and in each Month the Dates and Hours of Observation when Fogs were Recorded, at 26 Stations in Michigan.*

STATIONS IN MICHIGAN.*	No. Days in 1881.	January.		February.		March.		April.	
		Day of Month.	Hour of Observation.	Day of Month.	Hour of Observation.	Day of Month.	Hour of Observation.	Day of Month.	Hour of Observation.
Marquette	21					16, 19	7 A. M.		
Escanaba	10								
Alpena	31			9	7 A. M.				
				9	2 P. M.	6, 8	9 P. M.		
Grand Haven	9	19	7 A. M.					24	7 A. M.
								25	9 P. M.
Reed City	4	19	7 A. M.						
Port Huron	47	5, 18, 19	7 A. M.	5, 6	7 A. M.	7	7 A. M.	27	9 P. M.
		11, 17, 18	9 P. M.						
Thornville	7			8, 26, 27		16	Toward night.		
Agr'l College, near Lansing	4					7	7 A. M.		
Hastings	13	17, 19	7 A. M.	9	7 A. M.	7, 9, 18	7 A. M.	7	7 A. M.
Ionia (House of Cor.)	8	6, 19	Forenoon.						
Lansing	26	5	8:40 A. M.						
		16, 18, 19, 20	7 A. M.	4, 9	Morning.	7	7 to 10 A. M.		
		17	9 P. M.	8, 9	Afternoon.				
Otisville	5	19	7 A. M.						
Winfield	7	18	7 A. M.			7	7 A. M.		
Benton Harbor	4	19, 20				10			
Niles	2			19					
Ann Arbor	8	18, 19, 20	7 A. M.						
		20	2 P. M.						
Battle Creek	1								
Coldwater	5	20		19, 25	In morning.	7, 10	7 A. M.		
Hillsdale	8	17, 20	7 A. M.			10	7 A. M.	7	7 A. M.
						12, 16	9 P. M.		
Mallory Lake	3	20		8, 9					
Kalamazoo	6			9, 10	From morning of Feb. 9 to morning of Feb. 10.			7	In morning
Mondon	8	19, 20	7 A. M.			7, 10	7 A. M.	7	7 A. M.
Park	10	19, 20		9, 18, 19, 25		7, 10			
Tecumseh	4			8, 9	In morning.	16	Night.		
Detroit	17	11, 18, 20	7 A. M.			7, 8	7 A. M.		
						15	9 P. M.		
Washington	18	18, 20	7 A. M.	8	9 P. M.	13	7 A. M.		
				9	7 A. M.				
				9	2 P. M.				

* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 7, page 445.

EXHIBIT 23.—CONTINUED.—*Dates when Fogs were Recorded in 1881.*

STATIONS IN MICHIGAN.*	MAY.		JUNE.		JULY.		AUGUST.	
	Day of Month.	Hour of Observation.	Day of Month.	Hour of Observation.	Day of Month.	Hour of Observation.	Day of Month.	Hour of Observation.
Marquette	8, 9, 10, 11, 27, 28, 29, 30, 31	7 A. M.	26	7 A. M.	11	7 A. M.	4, 21	9 P. M.
	10, 27, 28, 29, 30, 31	2 P. M.	16	9 P. M.	11	2 P. M.	....	....
	26, 27, 28, 29, 31	9 P. M.	....	....	....	....	....	....
Escanaba	8, 11, 14	7 A. M.	....	....	12	7 A. M.	9, 25, 29, 30	7 A. M.
	....	....	....	....	....	....	18	2 P. M.
Alpena	6, 10, 24, 25, 26, 28	7 A. M.	11, 17	7 A. M.	....	....	5, 25, 26, 27, 28, 29	7 A. M.
	7	2 P. M.	11	2 P. M.	....	....	24, 25, 27, 28, 29	2 P. M.
	9	9 P. M.	....	....	....	....	4, 6, 10, 27, 28	9 P. M.
Grand Haven	....	....	....	....	....	....	23	7 A. M.
Reed City	6	7 A. M.	....	....	....	....	....	....
Port Huron	6, 7, 11, 22, 28	7 A. M.	10	7 A. M.	1, 2, 9, 12, 23, 31	7 A. M.	1, 2, 3, 19, 21, 23, 24, 28	7 A. M.
	23, 30, 31	2 P. M.	10, 30	2 P. M.	10, 11	2 P. M.	....	....
	28	9 P. M.	10	9 P. M.	....	....	....	....
Thornville	....	....	....	....	....	....	16	In morning.
Hastings	31	7 A. M.	....	....	....	....	....	....
Ionia (House of Correction)	....	....	....	....	30	7 A. M. & 2 P. M.	....	....
Lansing	19, 22	7 A. M.	26	Morning.	31	7 A. M.	19, 20	7 A. M.
Otisville	....	....	....	....	....	....	16	7 A. M.
Winfield	6, 20	7 A. M.	....	....	....	....	....	....
Benton Harbor	6	....	....	....	....	....	....	....
Niles	....	....	....	....	....	....	25	....
Ann Arbor	....	....	....	....	8, 31	7 A. M.	....	....
Hillsdale	6	7 A. M.	....	....	11	7 A. M.	....	....
Kalamazoo	6	In morning.	....	....	....	....	....	....
Mendon	6	7 A. M.	....	....	....	....	....	....
Ypsilanti	7	....	....	....	....	....	....	....
Washington	7	7 A. M.	....	....	....	....	1, 29	7 A. M.

* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 7, page 445.

EXHIBIT 23.—Continued.—*Dates when Fogs were Recorded in 1881.*

STATIONS IN MICHIGAN.*	September. Day of Month.	September. Hour of Observation.	October. Day of Month	October. Hour of Observation.	November. Day of Month.	November. Hour of Observation.	December. Day of Month.	December. Hour of Observation.
Marquette	2	7 A. M.	15	7 A. M.				
	3	9 P. M.	30	2 P. M.				
Escanaba	22	7 A. M.					13	7 A. M.
Alpena	1, 4	7 A. M.	2, 29	7 A. M.				
	1, 8, 21	2 P M.						
	3, 6	9 P. M.	2	9 P. M.				
Grand Haven	2, 3	7 A. M.	9	7 A. M.			20	7 A. M.
							13	2 P. M.
Reed City			13	2 P. M.			28	7 A. M.
							13	2 P M.
Port Huron	1, 2, 3, 4, 8, 13, 14, 18, 19.	7 A. M.	21, 23	7 A. M.	2	7 A. M.	12	9 P. M.
	1, 3	9 P. M.						
Thornville	21	7 A. M.					26	
Agr'l College, near Lansing	2, 13, 21	7 A M.						
Hastings	3, 19, 21, 29	7 A. M.	9	7 A. M.				
Ionia (House of Correction)	3, 10, 21	7 A. M.	9	7 A. M.			20	7 A. M.
Lansing	2, 13, 21	7 A. M.	2, 17, 23	7 A. M.			22	7 A M
			17	9 P. M.			12, 21, 26	9 P. M.
Otisville	4, 13, 21	7 A. M.						
Winfield	2, 21	7 A. M.					12	9 P. M.
Ann Arbor	2, 21	7 A. M.	19	7 A. M.				
Battle Creek	21	7 A. M.						
Kalamazoo	2, 3	In morning.						
Mendon	3	7 A. M.	19	7 A. M.				
Park	21						12	Afternoon.
							20	Evening.
							26	Forenoon.
Tecumseh	21	7 A. M.						
Detroit	2, 21, 22, 29	7 A. M.	1, 19, 21, 23, 27	7 A. M.			20, 22	7 A M.
							20, 22	2 P M.
							22	9 P. M.
Washington	4, 21	7 A. M.	23, 24, 28	7 A M.	2	7 A M.	13, 22	7 A. M.
			24	2 P. M.			22	2 P. M.
							12, 22, 26	9 P. M.

* The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 7, page 445.

PARHELIA AND SOLAR AND LUNAR HALOS.

JANUARY.

Lunar halos on Jan. 9, 10, and 14 of about 22° radii and on the 14th also corona around the moon; colors rather indistinct —*Alpena.*

Lunar halos Jan. 6, 8, and 14 —*Lansing.*

FEBRUARY.

Lunar halos Feb. 1, 2, 6, and 18.—*Lansing.*

Two parhelia 8 A. M. Feb. 3 —*Lansing.*

Solar halo Feb. 5, 6, and 14.—*Lansing.*

Lunar halo Feb 14.—*Mallory Lake.*

Lunar halos of 22° radii on Feb. 6 and 11, colors indistinct.—*Alpena.*

MARCH.

Lunar halo March 7 and 8.—*Alpena.*

Solar halo March 2, 7, and 11.—*Lansing*

Lunar halo March 10.—*Lansing.*

Two parhelia, one on right and one on left of sun and part of a rainbow above the sun at 7 A. M., March 28. Three parhelia with partial solar halo at 7 A. M., March 29.—*Lansing.*

APRIL.

Lunar halo April 9.—*Alpena.*

Solar halos April 14 and 23.—*Alpena.*

Lunar halo April 9.—*Thornville.*

Parhelion 5 P. M , April 4. Solar halo April 9, 10, and 14. Lunar halo April 9 and 10.—*Lansing.*

Lunar halos April 7, 9 to 11 P M. The moon had four halos: 1st yellowish, diameter 2°; 2d, faint orange, 3°; 3d, faint white, 6°; 4th, very faint, 40°.—*Ann Arbor.*

Lunar halos April 1 and 9.—*Mallory Lake.*

Solar halos April 7, 9, and 14.—*Mallory Lake.*

MAY.

Lunar halo May 4.—*Thornville.*

Solar halo May 4 and 6. Lunar halo May 4.—*Lansing.*

JUNE.

Solar halo June 9. Lunar halo on the 6th —*Alpena.*

Solar halo June 6, 11, 15, 20, and 29.—*Lansing.*

JULY.

Solar halo morning of July 14.—*Lansing.*

AUGUST.

Solar halo August 25.—*Alpena.*

OCTOBER.

Lunar halo Oct. 30.—*Thornville.*

Solar halo Oct 27.—*Lansing.*

NOVEMBER.

Lunar halo Nov. 10.—*Alpena.*

Lunar halo Nov. 1 and 4. Section of rainbow, north, 8 A. M., Nov. 29.—*Lansing.*

DECEMBER.

Lunar halos Dec. 2, 26, and 27.—*Alpena.*

Parhelia Dec. 8.—*Lansing.*

Lunar halo Dec. 8 and 16.—*Thornville.*

Lunar halo Dec. 11.—*Lansing.*

SMOKE, FOREST FIRES, ETC.

JANUARY.

Smoky appearance of the atmosphere 9 P. M. Jan. 8. Smoky appearance of atmosphere 9 P. M., Jan. 9. Smoke and fog 9 P. M., Jan. 17. Smoke and fog 7 A. M., Jan. 18. Smoke and fog 7 A. M., Jan. 19. Hazy 9 P. M., Jan. 28.—*Lansing.*

FEBRUARY.

Hazy Feb. 5. Hazy 9 P. M Feb. 1. Hazy night of Feb. 20 and 21.—*Lansing.*

MAY.

Heavy smoke prevailed May 24 and 25.—*Escanaba.*

Smoky appearance of atmosphere morning of May 20.—*Lansing.*

JUNE.

Smoky appearance of atmosphere in afternoon, June 5, and hazy in morning and during day, June 30.—*Lansing.*

JULY.

Forest fires doing considerable damage in this vicinity July 30 and 31. Railroad ties, cedar posts, telegraph poles, lumber and standing timber were consumed by the flames.—*Escanaba.*

Hazy 9 P. M., July 28. Smoky 7 A. M., July 29. Smoky July 29 and 30. Fog and smoke 7 A. M., July 31; fog raised about 7:10 A M.—*Lansing.*

SEPTEMBER.

The rains beginning on Sept. 10 brought to an end the worst drought ever known in this part of Michigan. Fighting fire was the main business of the previous three weeks for everybody, after going a few miles to the north and northeast of this point. The smoke from the fires was tedious, and, by spells, when the wind was northerly, as dense as the thickest fog. The worst dry spell of all was Sept. 7, on which day the smoke came down on us at 11 A. M with a black cloud that could be seen miles away before it reached us. Lapeer county is not badly burnt as compared with St.

Clair and Sanilac, but considerable property has been lost, and some lives. The nearest fatal accident was at Fish Lake, 18 miles from here, where a woman named Elliott was overtaken by the fire while trying to escape with a load of valuables, which she was repeatedly advised by others to throw down. Since the rains came the growth of vegetation is unprecedented, the fall pastures being already good, when none was expected. Wheat fully as good on Sept. 30 as last year when winter set in.—*Thornville.*

Hazy and smoky appearance of the atmosphere in the morning, Sept. 2.—*Hudson.*

Smoky appearance of atmosphere. Oct, 23.—*Lansing.*

EXHIBIT 19.—*Comparison of the Average Per Cent of Cloudiness in the Year and in each Month of the Year 1881, with Averages for the 17 Years 1864–80, and for the Year 1880. Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agricultural College,* near Lansing, Michigan.*

YEARS, ETC.	Per Cent of Cloudiness.												
	Ann. Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 17 Years, 1864–80*	58	73	64	64	57	51	49	46	48	50	58	67	76
1880	55	63	62	56	48	41	47	45	52	47	52	50	77
1881	57	65	66	67	49	37	58	38	40	50	67	74	67
In 1881 Greater than Av. 17 yrs, 1864–80	......	....	4	3	....	....	9	....	....	0	9	7	....
In 1881 Less than Av. 17 years, 1864–80.	1	8	....	....	8	14	....	8	8	0	....	....	9
In 1881 Greater than in 1880	2	2	3	11	1	....	11	....	....	3	15	24	....
In 1881 Less than in 1880	......	....	....	....	....	4	....	7	12	....	....	....	10

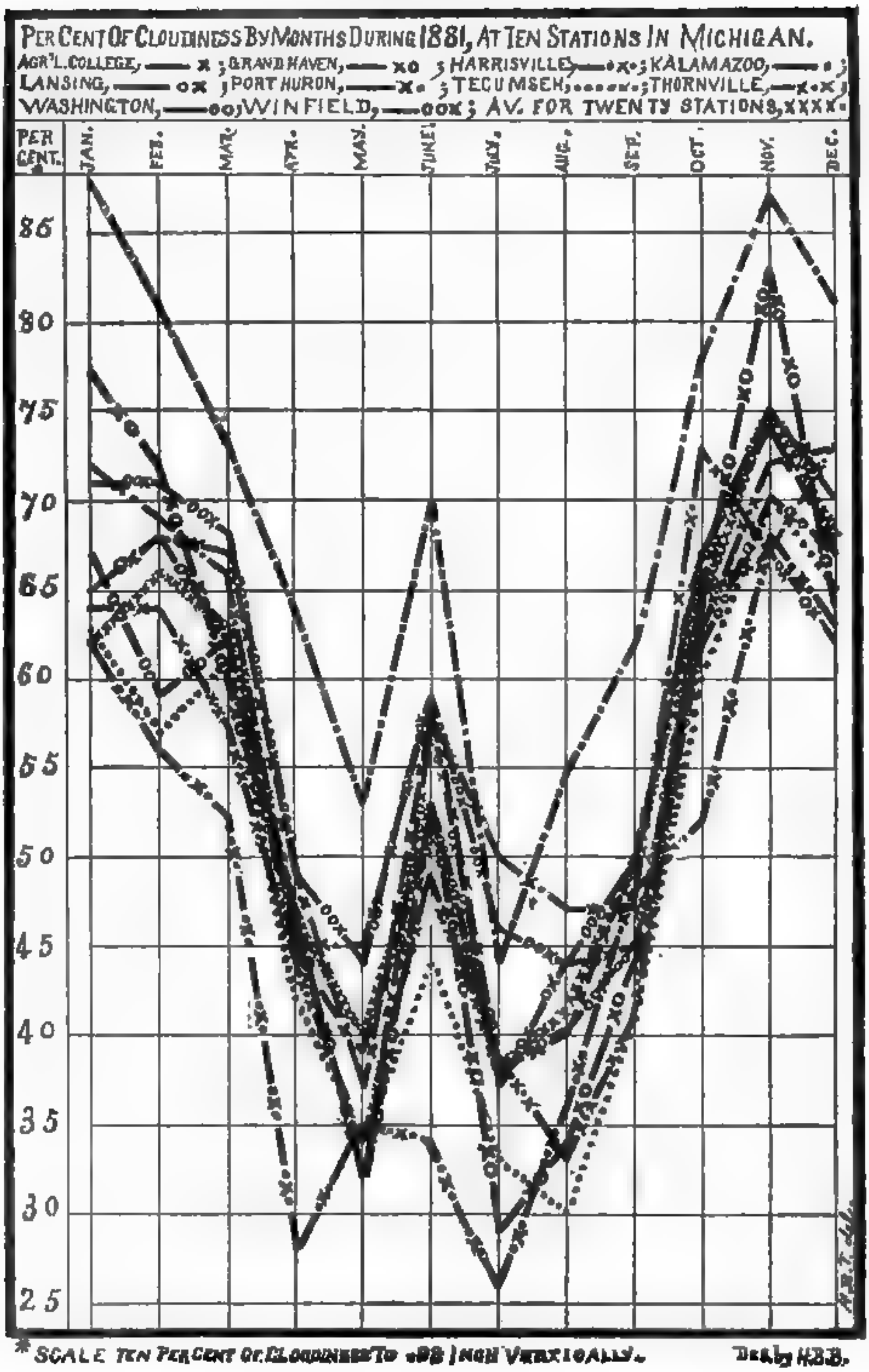
* For November and December, 1879, and January, 1881, the observations were made by Harry B. Turner, at the office of the State Board of Health, Lansing.

EXHIBIT 20.—*Average Per Cent of Cloudiness, by Year and Months, in 1881, compared with Annual and Monthly Averages for the 5 years, 1877–1881.**

YEARS, ETC.	Per Cent of Cloudiness.												
	Ann. Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 Years, 1877–1881	54	65	58	61	49	42	46	40	51	46	57	68	77
1877 (13 stations*)	51	65	44	63	47	36	47	36	42	35	63	71	68
1878 (12 stations*)	54	71	55	62	53	48	41	45	34	43	59	57	83
1879 (19 stations*)	53	68	66	61	43	41	41	34	39	47	48	68	89
1880 (21 stations*)	57	64	61	55	57	45	50	45	50	48	57	68	83
1881 (20 stations*)	56	63	66	63	47	40	53	38	41	50	65	75	68
In 1881 Greater than Av. 1877–81	2	....	8	2	....	....	7	....	....	4	8	7	....
In 1881 Less than Av. 1877–81	......	3	....	....	2	2	....	2	10	....	....	....	9

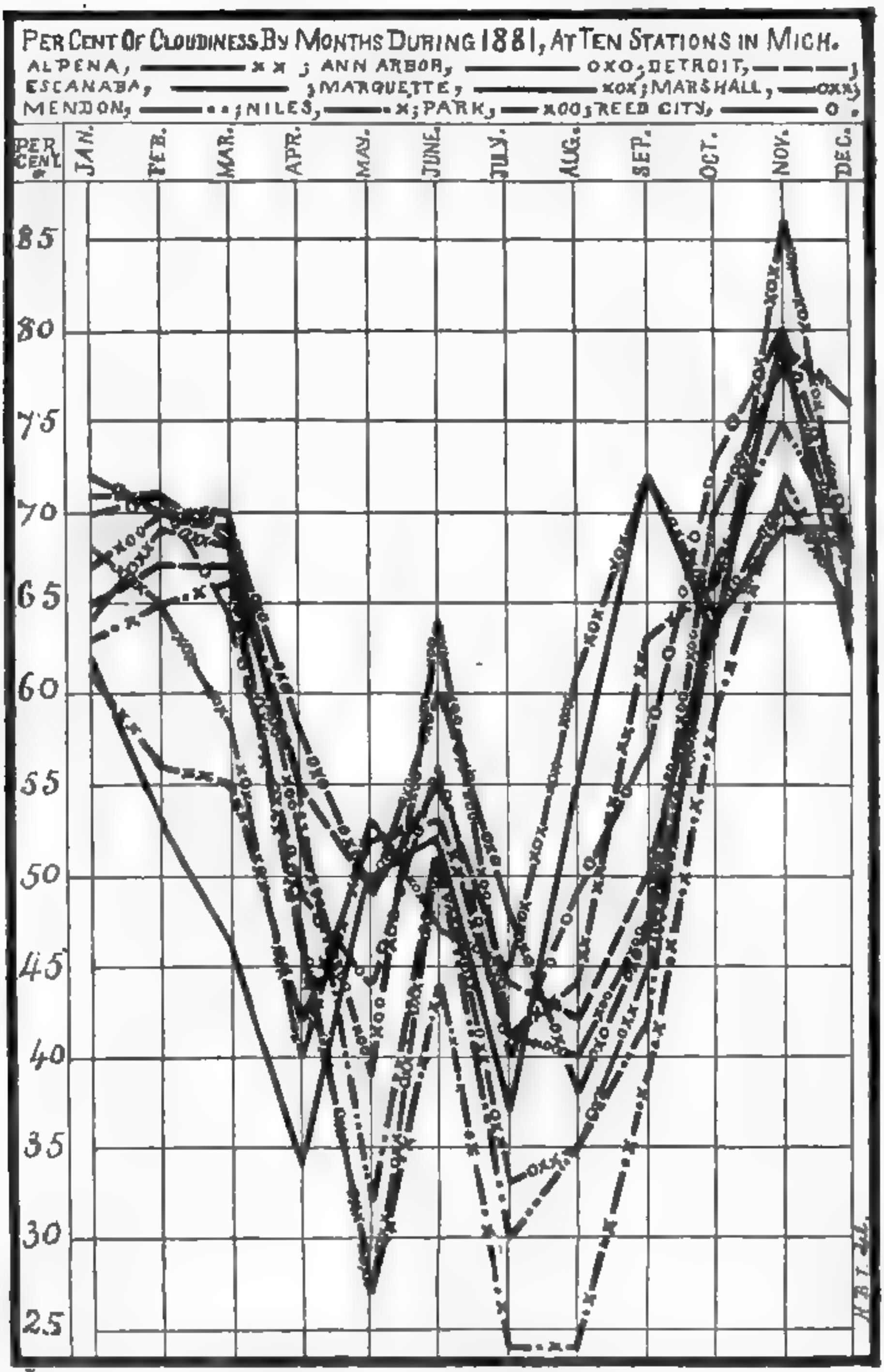
* Thornville, Kalamazoo, Mendon, and Tecumseh for the 5 years 1877–81,—also Battle Breek for 1877–80; Nirvana for 1877–9, and first 4 months of 1880; Reed City for last 8 months of 1880, and for 1881; Detroit for 1877 and 1879–81; Niles for 1878–81; Benton Harbor for 1877, 1878, 1880; Coldwater and Woodmere Cemetery for 1877–9; Otisville for 1878–80; Marquette, Alpena, Grand Haven, Port Huron, Lansing and Washington for 1879–81; Ypsilanti for 1877, 1879; Agricultural College for 1877, 1881; Petoskey for 1878–9; Escanaba and Ann Arbor for 1880–1; Fife Lake for 1877; Ionia, Adrian, and Hillsdale for 1880; Marshall, Park, Winfield, and Hudson and Mallory Lake for 1881.

DIAGRAM VII.—CLOUDINESS, BY MONTHS, IN 1881.



* SCALE TEN PER CENT OF CLOUDINESS TO .98 INCH VERTICALLY. Del. by H.B.B.

DIAGRAM VIII.—CLOUDINESS, BY MONTHS, IN 1881.



* SCALE, TEN PER CENT OF CLOUDINESS TO .98 INCH VERTICALLY. DES. by H.B.B.

TABLE VI.—*Average Per Cent of Cloudiness, for the Year and for each Month of the Year 1881, at 28 Stations in Michigan.—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,* by Observers for the State Board of Health†, and for the U. S. Signal Service.*

STATIONS IN MICHIGAN † (Those of the U. S. Signal Service in italics).	Division of the State.‡	Average Per Cent of Cloudiness.															
		Years.				Months, 1881.											
		1878.	1879.	1880.	1881	Jan.	Feb	M'ch.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 stations§	....	[a]	[b]	[c]	56	63	66	63	47	40	53	38	41	50	65	75	68
Marquette	U. P.	....	67	62	60	68	65	58	40	53	47	45	61	72	64	86	65
Escanaba	U. P.	....	....	61	56	62	63	[e]48	34	60	52	37	55	72	63	80	82
Alpena	N. E.	....	53	58	57	61	56	55	42	52	53	41	44	63	68	79	76
Harrisville	N. E.	....	....	....	47	[illegible]	56	52	28	35	34	26	38	48	52	68	65
Grand Haven ...	W.	....	54	57	55	77	72	60	47	32	53	39	34	44	65	83	64
Reed City	W.	59	59	63	60	70	71	64	[g]49	44	56	40	49	57	73	80	68
Port Huron	B. & E.	....	58	60	59	72	69	68	45	45	58	50	47	47	73	67	73
Thornville	B. & E.	56	52	55	63	64	64	57	44	34	49	30	33	41	63	72	78
Agr'l College ...	C.	58	54	65	57	65	68	67	40	37	58	38	40	50	67	74	67
Hastings	C.	....	....	....	(62)‖	76	[d]74	68	53	35	61	40	....	[h]65	[d]71	81	69
Ionia	C.	....	....	61	(60)‖	81	73	61	43	31	....	....	....	....	....	....	68
Lansing, S. B. of H.	C.	....	54	64	54	65	68	62	46	32	58	37	44	45	65	67	62
Otisville	C.	60	61	54	(62)‖	[k]54	....	....	....	....	....	61	47	55	71	74	71
Winfield	C.	....	....	....	59	71	71	65	49	44	59	46	44	49	67	75	70
Niles	S. W.	48	46	49	49	63	65	66	46	27	44	24	24	39	59	72	64
Adrian	S.	....	....	64	(65)‖	[d]72	81	73	[g]62	[f]49	64	61	....	....	....	....	....
Ann Arbor	S.	....	....	60	50	72	70	69	58	40	60	48	38	47	64	71	65
Battle Creek ...	S.	61	60	49	(46)‖	63	59	50	34	25	50	25	....	38	49	51	58
Coldwater	S.	45	60	....	(43)‖	57	63	61	41	26	39	17	....	....	....	....	....
Hillsdale	S.	....	....	59	(63)	78	76	74	58	44	68	48	51	....	....	69	70
Kalamazoo	S.	67	68	69	70	88	81	73	64	53	70	44	55	62	78	67	81
Mallory Lake & Hudson ....¶	S.	....	....	....	56	65	72	65	53	31	49	34	[r]39	48	67	75	71
Marshall	S.	....	....	....	53	[h]64	69	[e]68	[p]47	[n]27	[l]51	[h]33	[g]35	[m]45	64	69	66
Mendon	S.	52	50	54	55	71	71	65	[illegible]	[j]32	[l]51	[illegible]	35	42	[f]67	[h]75	[f]66
Park	S.	....	....	....	59	67	70	70	52	39	64	41	40	47	70	76	67
Tecumseh	S.	50	44	47	50	63	57	61	42	34	44	33	30	4	60	70	[illegible]
Detroit	S. E.	....	57	59	58	65	67	67	55	49	55	44	42	50	61	69	69
Washington	S. E.	....	59	54	54	[d]67	59	62	45	39	52	38	40	45	62	70	67

* At stations of the U. S. Signal Service for the last six months of the year the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table IV, page 465.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 7, page 445.

‡ The full names of divisions and the counties in each division are stated in Exhibit 1, page 287.

§ This line is an average for only the stations from which statements were received for every month of the year; it does not include the line for Mallory Lake and Hudson.

‖ An average not for the year, but for the months in 1881 represented in this line.

¶ The observations compiled in this line were made at Mallory Lake until Aug. 1. After that date they were made by another observer at Hudson. Mallory Lake is two miles west and one and one-half miles south from Hudson.

[a] The average for 13 stations in 1878 is 54 per cent.

[b] The average for 19 stations in 1879 is 53 per cent.

[c] The average for 21 stations in 1880 is 57 per cent.

[d] For 90 observations. [e] For 89 observations. [f] For 88 observations.

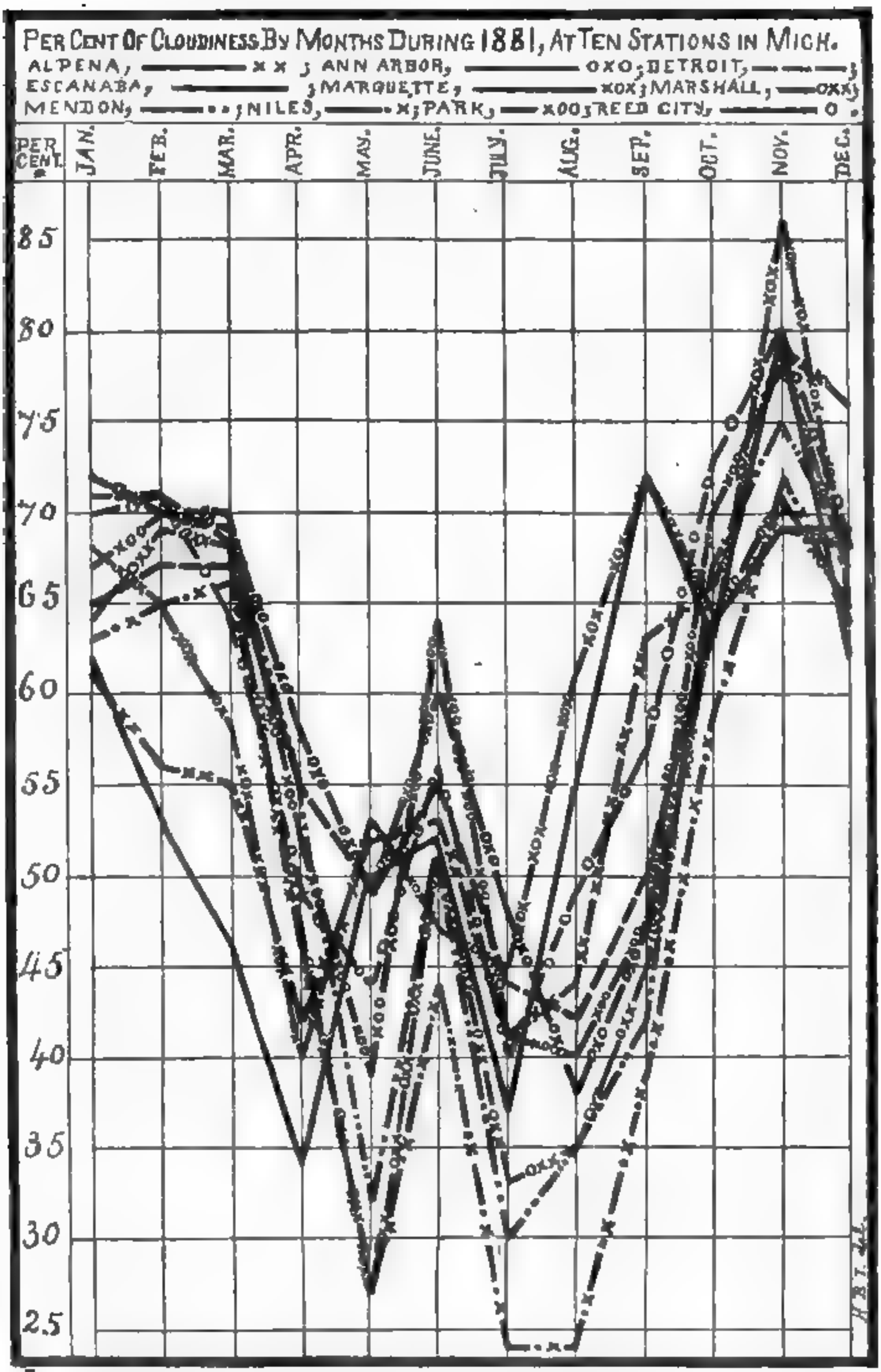
[g] For 87 observations. [h] For 86 observations. [i] For 85 observations.

[j] For 84 observations. [k] For 83 observations. [l] For 80 observations.

[m] For 78 observations. [n] For 76 observations. [o] For 75 observations.

[p] For 74 observations. [q] For 67 observations. [r] For 65 observations.

DIAGRAM VIII.—CLOUDINESS, BY MONTHS, IN 1881.



* SCALE, TEN PER CENT OF CLOUDINESS TO .98 INCH VERTICALLY.

TABLE VI.—*Average Per Cent of Cloudiness, for the Year and for each Month of the Year 1881, at 28 Stations in Michigan.—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,* by Observers for the State Board of Health†, and for the U. S. Signal Service.*

STATIONS IN MICHIGAN † (Those of the U. S. Signal Service in italics).	Division of the State ‡	Average Per Cent of Cloudiness. Years. 1878.	1879.	1880.	1881.	Months, 1881. Jan.	Feb.	M'ch.	April	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 stations§	....	[a]	[b]	[c]	56	63	66	63	47	40	53	38	41	50	65	75	68
Marquette	U. P.	....	67	62	60	68	65	58	40	63	47	45	61	72	64	66	65
Escanaba	U. P.	....	....	61	56	62	53	[e]48	34	60	52	37	55	72	63	80	62
Alpena	N. E.	....	53	58	57	61	56	55	42	52	53	41	44	63	68	79	76
Harrisville	N. E.	....	....	....	47	62	56	52	28	35	34	26	36	48	52	68	63
Grand Haven	W.	....	54	57	55	77	72	60	47	32	53	29	34	44	65	83	64
Reed City	W.	59	59	63	60	70	71	64	[g]40	44	56	40	40	57	73	80	68
Port Huron	B. & E.	....	58	60	59	72	69	66	45	45	56	50	47	47	73	67	78
Thornville	B. & E.	55	52	55	53	64	64	57	44	34	40	30	33	41	63	72	73
Agr'l College	C.	58	54	55	57	65	63	67	49	37	58	38	40	50	67	74	67
Hastings	C.	....	....	....	(62)‖	76	[q]74	68	53	35	61	40	....	[h]55	[d]71	81	69
Ionia	C.	....	....	61	(60)‖	81	73	61	43	31	....	....	....	....	....	....	68
Lansing, S. B. of H.	C.	....	54	54	54	65	68	62	46	32	58	37	44	45	65	67	62
Otisville	C.	60	51	54	(62)‖	[k]54	....	....	....	....	....	51	47	53	71	74	71
Winfield	C.	....	....	....	59	71	71	66	49	44	59	46	44	40	67	75	70
Niles	S. W.	48	46	40	49	63	65	66	46	27	44	24	24	30	59	72	64
Adrian	S.	....	....	64	(65)‖	[d]72	81	73	[m]62	[f]49	64	51	....	....	....	....	....
Ann Arbor	S.	....	....	60	59	72	70	69	58	40	60	48	38	47	64	71	65
Battle Creek	S.	61	50	49	(46)‖	63	59	50	34	25	50	25	....	38	49	51	56
Coldwater	S.	45	50	....	(43)‖	57	63	61	41	20	30	37	....	....	....	....	....
Hillsdale	S.	....	....	59	(63)	73	76	74	58	44	63	43	51	....	....	69	70
Kalamazoo	S.	67	68	69	70	88	81	73	64	53	70	44	55	62	78	67	81
Mallory Lake & Hudson ¶	S.	....	....	....	56	65	72	65	53	31	49	34	[r]39	48	67	75	71
Marshall	S.	....	....	....	53	[h]64	69	[o]68	[p]47	[n]27	[l]51	[h]33	[g]35	[m]45	64	69	68
Mendon	S.	52	50	54	55	71	71	68	55	[j]32	[l]51	30	35	42	[f]67	[h]75	[f]69
Park	S.	....	....	....	59	67	70	70	52	30	64	41	40	47	70	79	67
Tecumseh	S.	50	44	47	50	63	57	61	42	34	44	33	30	41	60	70	65
Detroit	S. E.	....	57	59	58	65	67	67	55	49	55	44	42	50	61	69	69
Washington	S. E.	....	59	54	54	[d]67	59	62	45	39	52	38	40	45	62	70	67

* At stations of the U. S. Signal Service for the last six months of the year the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of those stations is stated in the star (*) foot-note to Table IV, page 465.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 7, page 445.

‡ The full names of divisions and the counties in each division are stated in Exhibit 1, page 287.

§ This line is an average for only the stations from which statements were received for every month of the year; it does not include the line for Mallory Lake and Hudson.

‖ An average not for the year, but for the months in 1881 represented in this line.

¶ The observations compiled in this line were made at Mallory Lake until Aug. 1. After that date they were made by another observer at Hudson. Mallory Lake is two miles west and one and one-half miles south from Hudson.

[a] The average for 13 stations in 1878 is 54 per cent.
[b] The average for 19 stations in 1879 is 53 per cent.
[c] The average for 21 stations in 1880 is 57 per cent.

[d] For 90 observations.	[e] For 89 observations.	[f] For 88 observations.
[g] For 87 observations.	[h] For 86 observations.	[i] For 85 observations.
[j] For 84 observations.	[k] For 83 observations.	[l] For 80 observations.
[m] For 78 observations.	[n] For 76 observations	[o] For 75 observations.
[p] For 74 observations.	[q] For 67 observations.	[r] For 65 observations.

EXHIBIT 24.—*Comparison of the Rainfall during the Year and during each Month of the Year 1881, with that for the Year 1880 and with the Average for the 17 Years 1864–80; Observations made by Prof. R. C. Kedzie, at the State Agricultural College,* near Lansing, Michigan.*

YEARS, ETC.	Inches of Rain and Melted Snow.												
	Year.	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 17 Yrs., '64-80	31.02	1.74	1.68	2.69	2.65	2.89	3.88	3.43	2.78	3.01	2.27	2.06	1.88
1880	43.89	2.67	1.62	1.70	6.40	5.59	5.04	6.27	6.02	3.10	2.31	2.32	.85
1881	34.66	2.27	3.77	2.66	1.78	2.11	4.37	1.81	1.63	2.91	5.56	4.09	1.75
In 1881 Greater than Av. 1864-80	3.64	.53	2.09	......	......	......	.49	......	......	......	3.29	2.03	......
In 1881 Less than Av. 1864-80	.....	......	......	.03	.92	.88	......	1.62	1.15	.10	......	......	.13
In 1881 Greater than in 1880	......	......	2.15	.96	......	......	......	......	......	......	3.25	1.77	.90
In 1881 Less than in 1880	9.23	.40	......	......	4.67	3.48	.67	4.46	4.39	.19	......	......	......

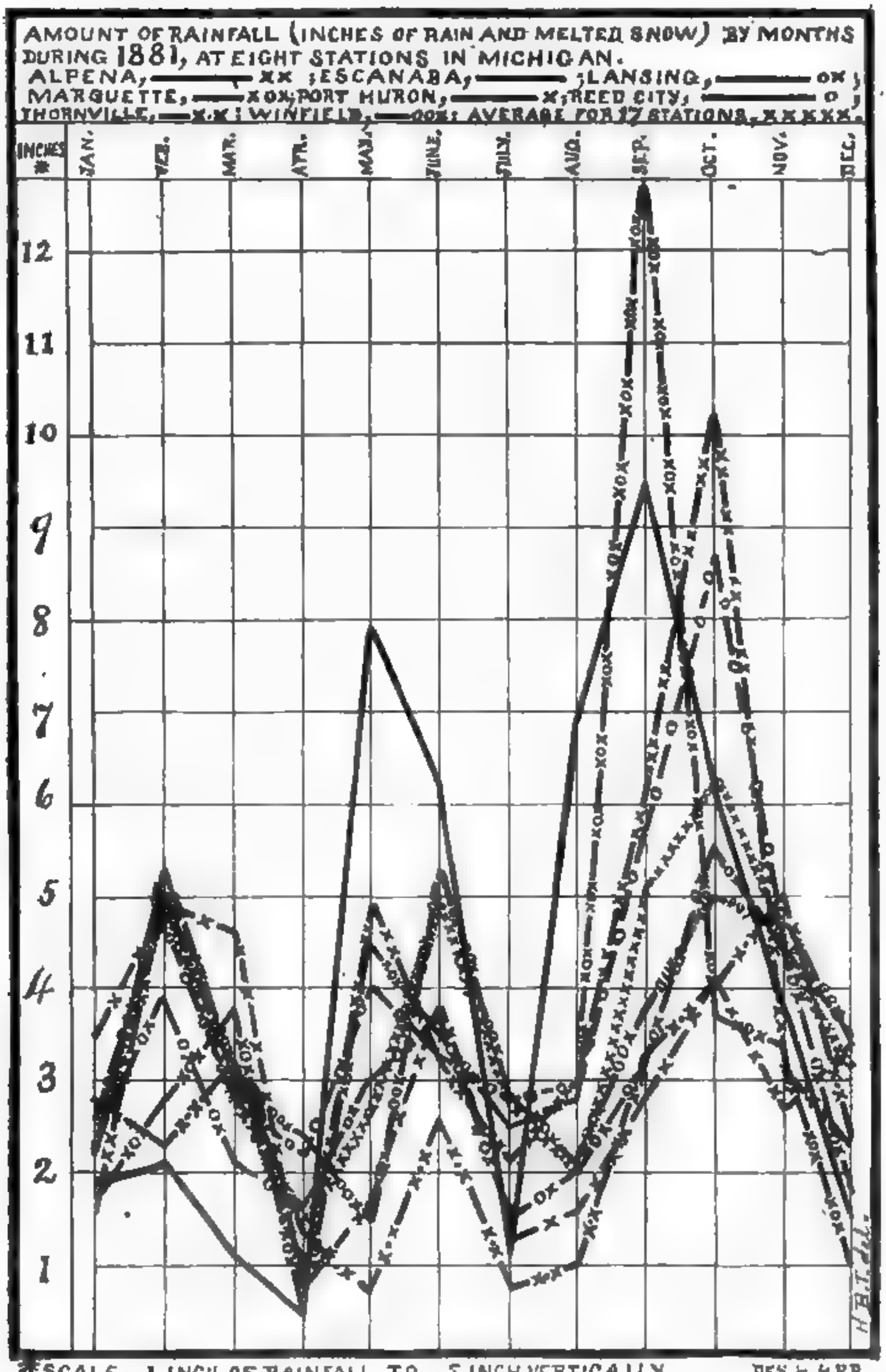
* For November and December, 1879, and January, 1881, the observations were made by Harry B. Turner, at the office of the State Board of Health, Lansing.

EXHIBIT 25.—*Inches of Rain and Melted Snow by Year and Months, in 1881 compared with Annual and Monthly Averages for the 5 Years, 1877–1881.**

YEARS, ETC.	Inches of Rain and Melted Snow.												
	Year.	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 yrs., 1877-81	38.95	1.87	2.30	2.83	3.07	3.02	4.06	3.96	3.42	3.90	4.00	3.74	2.77
1877 (13 stations*)	35.24	1.57	0.03	4.22	2.83	1.49	4.60	3.06	5.00	1.62	5.02	4.23	1.58
1878 (12 stations*)	38.06	1.62	2.63	3.22	3.71	3.22	2.66	5.18	3.04	3.84	3.56	2.11	3.32
1879 (12 stations*)	36.38	1.16	2.26	1.94	1.74	2.28	3.31	3.76	2.17	5.97	2.31	5.37	4.11
1880 (14 stations*)	41.88	2.71	1.56	1.87	5.53	5.44	4.84	5.03	4.86	2.98	2.84	2.53	1.70
1881 (17 stations*)	43.21	2.31	5.01	2.38	1.53	2.67	4.90	2.84	2.03	5.11	6.29	4.48	3.16
In 1881 Greater than Av., 1877-81	4.26	.44	2.71	.05	......	......	.84	......	......	1.21	2.29	.74	.39
In 1881 Less than Av. 1877-81	......	......	......	......	1.54	.35	......	1.12	1.39	......	......	......	......

* Thornville, Kalamazoo, and Detroit for 5 years 1877-81,—also Mendon and Tecumseh for 1877, 1878, 1880, and 1881; Niles for the 4 years 1878-81; Nirvana, Coldwater, and Woodmere Cemetery (near Detroit) for 3 years 1877-79; Agricultural College for 1877, 1878, 1881; Otisville for 3 years 1878-80; Marquette, Alpena, Grand Haven, and Port Huron, for 3 years 1879-81; Battle Creek and Benton Harbor for 1877, 1878; Escanaba, Lansing, and Washington for 1880, 1881; Fyfe Lake and Ypsilanti for 1877; Harrisville, Reed City, Winfield, Ann Arbor, Marshall, and Hudson and Mallory Lake for 1881.

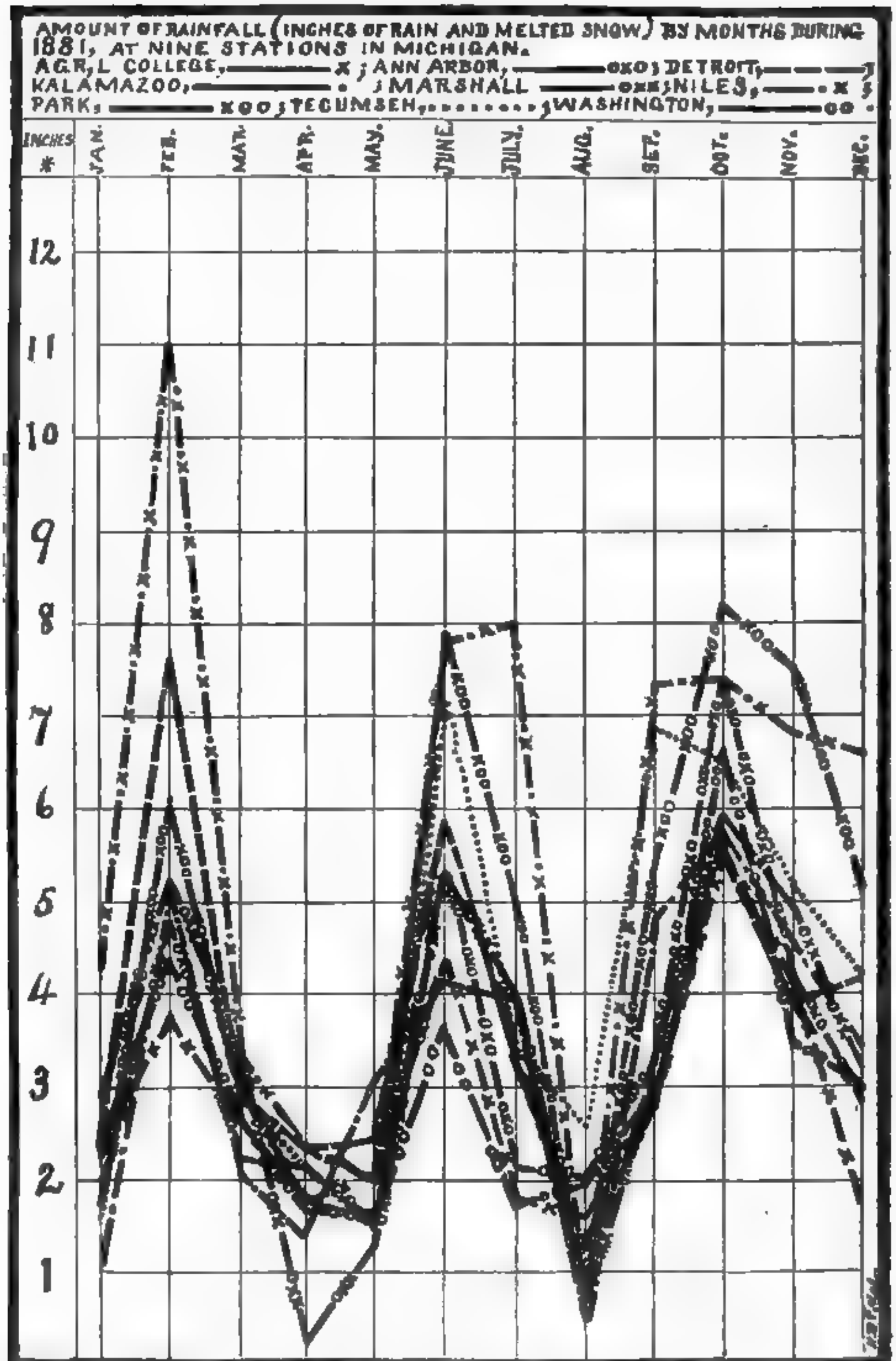
DIAGRAM X.--RAINFALL, BY MONTHS IN 1881.



*SCALE, 1 INCH OF RAINFALL TO .5 INCH VERTICALLY. DES. by H.B.B.

BOSTON PHOTO-ENG. CO.

DIAGRAM XI.—RAINFALL, BY MONTHS IN 1881.



* SCALE, 1 INCH OF RAINFALL TO .5 INCH VERTICALLY. DES by H.B.B.

BOSTON PHOTO-ENG. CO.

TABLE VII.—*Inches of Rain and Melted Snow, for the Year and for each Month of the Year 1881, at 28 Stations in Michigan,—as compiled from Daily Observations made by Observers* for the State Board of Health, and for the U. S. Signal Service.*

STATIONS IN MICHIGAN * (Those of the U S Signal Service in italics.)	DIVISION OF THE STATE.†	INCHES OF RAIN AND MELTED SNOW.														
		YEARS.			MONTHS, 1881.											
		1879.	1880	1881.	Jan.	Feb.	Mar.	Apr.	May	J'ne.	J'ly.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 17 Stations ‡......	......	a	b	45.20	2.81	5.01	2.88	1.58	2.67	4.90	2.64	2.03	5.11	6.29	4.48	3.16
Marquette......	U. P	40.46	33.51	42.90	1.69	[illegible]	3.84	.52	4.46	3.47	2.49	2.80	12.71	3.71	[illegible]	.98
Escanaba......	U. P.	.....	30.35	48.49	1.91	2.10	1.09	.44	7.91	6.21	1.10	6.87	9.48	6.13	3.72	1.66
Alpena..........	N. E.	39.94	43.64	45.61	1.59	5.04	3.04	.88	4.94	3.93	2.09	3.02	6.16	10.25	3.09	2.28
Harrisville.....	N. E.	.....	.....	37.42	1.75	4.50	3.50	1.09	3.21	2.96	1.70	4.51	5.03	4.72	3.47	[illegible]
Grand Haven..	W.	35.35	44.66	44.56	2.29	6.13	.46	1.59	1.19	3.37	4.78	1.91	6.71	7.67	4.19	3.77
Reed City......	W.	34.96	40.77	47.91	2.62	4.63	2.77	2.16	4.04	3.29	2.79	2.95	5.79	3.74	4.44	3.49
Port Huron....	E. & N.	27.23	38.47	35.29	3.48	4.91	4.63	.78	1.66	3.92	1.30	1.61	2.86	4.15	2.70	3.41
Thornville.....	E. & N.	31.60	39.00	29.58	2.75	2.29	3.21	1.55	.73	2.63	.74	1.04	3.27	4.10	5.05	2.41
Agr'l College, near Lansing.	C.	36.82	43.80	34.66	2.27	3.77	2.66	1.73	2.11	4.37	1.81	1.63	2.91	5.56	4.09	1.75
Hastings	C	.....	.....	§ 29.67	....	1.55	.....	.....	2.79	3.91	2.69	.....	3.73	7.06	4.96	3.06
Ionia	C.	.....	.....	§ 26.47	2.17	2.26	1.19	2.50	.50	.....	1.35	1.05	3.40	6.65	3.90	[illegible]
Lansing, State B'd of Health	C.	....	49.33	35.26	2.27	3.92	2.14	1.65	2.97	3.66	1.63	2.05	3.24	5.60	4.39	1.76
Otisville.......	C.	39.89	38.65	§ 15.66	2.39	.....	.....	.....	.....	.....	1.27	1.28	2.87	3.89	2.75	1.21
Winfield......	C.	.....	.....	41.60	2.23	5.28	3.00	2.40	1.54	5.81	2.82	2.00	3.79	6.03	4.68	5.45
Niles..........	S. W.	45.84	47.95	67.67	4.30	11.00	3.35	2.85	1.99	7.83	8.08	.65	7.96	7.41	6.81	6.69
Ann Arbor.....	S. C.	.....	.....	39.93	1.95	[illegible]	3.23	2.15	1.56	5.35	2.13	2.07	3.24	7.58	4.19	2.98
Coldwater.....	S. C.	.....	.....	§ 26.01	1.45	4.55	2.20	2.60	1.43	7.03	6.75	.....	.....	.....	.....	.....
Hillsdale.......	S. C.	.....	.....	§ 38.73	1.01	4.68	1.71	2.06	2.52	6.73	8.25	1.43	.....	....	5.30	4.99
Kalamazoo.....	S. C.	37.53	42.23	40.08	1.10	5.10	2.05	1.30	3.09	4.15	3.94	.47	4.84	5.61	4.63	3.46
Mallory Lake and Hudson‖ .	S. C.	.....	.....	46.61	1.46	3.89	1.60	1.18	.56	6.18	7.14	.79	5.45	[illegible]	5.18	3.55
Marshall.......	S. C	.....	.....	40.18	2.96	5.24	[illegible]	.90	1.29	5.28	3.95	.68	3.13	5.95	4.92	3.20
Mendon..	S. C.	....	45.45	42.31	1.06	5.85	2.75	1.58	.97	6.30	3.98	.50	8.94	5.61	5.94	4.38
Park...........	S. C.	.....	.....	53.88	1.75	5.98	3.10	1.80	1.54	7.89	5.02	.61	5.39	8.19	7.47	5.14
Tecumseh	S. C.	.....	42.20	50.27	1.64	6.05	2.92	2.15	1.53	7.14	3.33	2.64	6.88	6.52	5.19	4.22
Detroit..........	S. E	37.17	47.95	44.81	2.37	7.66	2.59	2.35	[illegible]	5.90	3.26	1.32	2.84	5.72	3.87	4.17
Washington....	S. E.	....	39.83	34.37	2.42	4.41	2.72	1.71	1.62	3.74	1.74	1.95	2.04	6.65	3.51	2.96

* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 7, page 445.

† The names of divisions, and the counties in each, are stated in Exhibit 1, page 287.

‡ This line is an average for the 17 stations from which statements were received for every month of the year. It does not include the line for Harrisville, Grand Haven, Mallory Lake and Hudson, or Mendon.

§ The number next below this mark is a total, not for the year, but for the months in 1881 represented in this line.

‖ The observations compiled in this line were made at Mallory Lake until Aug. 1. After that date they were made by another observer at Hudson. Mallory Lake is 2 miles west and 1½ miles south from Hudson.

a Average for 12 stations in 1879 is 36.88 inches. b Average for 14 stations in 1880 is 41.88 inches.

The lines for 17 representative stations in Table VII. are graphically represented in Diagrams X. and XI. pages 483 and 484.

EXHIBIT 26.—*Comparison of the Average Amount of Atmospheric Ozone, as Indicated by the Degree of Coloration* of Schonbein's Test-paper, during the Year and during each Month of the Year 1881, with the Average for the Nine Years 1872–80, and with the Average for 1880; also Statement of the Average for each of the Nine Years 1872-80,—Test-paper exposed from 7 A. M. to 2 P. M., for the Day Observation, and from 9 P. M. to 7 A. M. for the Night Observation,—Observations made by Prof. R. C. Kedzie, at the State Agricultural College,† near Lansing, Mich.*

OZONE,—DEGREES OF COLORATION.*

DAY OBSERVATION,—7 A. M. TO 2 P. M.*

Months.	1872	1873.	1874.	1875.	1876	1877.	1878.	1879. †	1880.	Av., 9 Years, 1872–80.	1881 †	In 1881 More (+), or Less (-), than Av., 9 Yrs., '72-80.		In 1881 More (+), or Less (-), than in 1880.	
Ann. Av.	2.84	4.02	4.10	4.53	3.68	2.60	3.50	3.24	4.01	3.73	4.00	+	.27	-	.04
Jan.	4.50	5.06	5.10	5.52	5.82	4.67	3.74	4.00	2.97	4.50	4.52	-	.04	+	1.55
Feb	4.00	4.21	5.53	5.78	5.76	4.34	5.00	4.54	3.83	4.80	3.76	-	1.05	-	.08
March...	3.00	4.09	5.00	5.70	6.06	5.29	4.09	3.93	5.52	4.81	4.52	-	.29	-	1.00
April....	2.64	3.76	5.70	3.73	3.70	3.70	4.37	3.00	5.10	3.97	4.50	+	.53	-	.60
May.....	2.11	4.58	5.30	3.19	3.10	3.29	3.07	2.79	3.65	3.61	3.94	+	.33	+	.29
June.....	1.91	3.28	3.56	3.96	1.87	3.17	3.17	2.43	3.77	3.00	3.73	+	.73	-	.04
July......	.88	3.59	1.60	3.52	2.16	2.71	2.10	2.90	3.61	2.50	4.45	+	1.95	+	.84
Aug... ...	.98	3.55	2.80	3.50	1.97	3.42	2.82	2.56	3.97	2.79	4.45	+	1.06	+	.48
Sept......	1.40	2.30	2.90	4.30	2.60	2.93	2.23	2.67	2.93	2.72	4.12	+	1.40	+	1.19
Oct.......	1.93	4.52	3.34	5.30	3.43	3.20	2.71	3.32	2.90	3.41	2.77	-	.64	-	.18
Nov. ....†	4.60	4.30	3.60	4.90	3.57	3.60	3.17	3.53	5.10	4.06	3.87	-	.19	-	1.23
Dec......†	5.81	4.97	4.00	5.00	4.57	3.17	4.65	2.97	5.16	4.47	3.30	-	1.06	-	1.77

NIGHT OBSERVATION,—9 P. M. TO 7 A. M.*

Months.	1872	1873.	1874.	1875	1876.	1877	1878.	1879. †	1880. *	Av., 9 Years, 1872–80.	1881. †	In 1881 More (+), or Less (-), than Av., 9 Yrs., '72-80.		In 1881 More (+), or Less (-), than in 1880.	
Ann. Av.	4.24	4.72	3.99	5.04	4.11	3.53	3.42	3.36	3.63	3.97	4.66	+	.69	+	1.03
Jan.	5.44	6.82	6.59	6.93	6.90	5.03	4.48	4.48	2.97	5.33	5.45	+	.12	+	2.48
Feb	6.00	5.95	6.10	6.57	7.27	4.14	5.23	5.01	4.17	5.61	5.54	-	.07	+	1.37
March...	5.71	5.60	6.09	6.19	7.00	6.06	4.94	4.30	4.94	5.06	6.00	+	.94	+	1.06
April....	5.30	4.77	6.60	3.96	5.53	4.27	4.59	4.00	4.93	4.82	6.07	+	1.25	+	1.14
May.....	3.84	5.59	4.99	4.03	4.13	2.94	4.10	2.88	3.03	3.80	4.26	+	.46	+	1.23
June.....	3.23	2.65	2.84	3.06	2.27	2.90	3.00	2.03	2.70	2.75	4.80	+	2.05	+	2.10
July......	2.28	3.06	1.50	3.22	1.58	1.77	1.74	2.13	2.23	2.17	4.10	+	1.93	+	1.87
Aug... ...	.99	2.65	1.10	3.70	1.26	1.03	1.52	1.76	2.23	1.80	3.53	+	1.73	+	1.30
Sept......	1.86	4.27	1.20	3.06	1.78	1.63	1.00	2.59	2.15	2.23	3.57	+	[redacted]	+	1.42
Oct.......	3.18	4.69	3.01	6.90	3.43	3.19	1.97	2.51	2.68	3.47	3.52	+	.05	+	.84
Nov. ....†	6.17	5.47	4.50	6.60	3.33	3.73	3.14	4.63	5.33	4.77	5.30	+	.53	-	.03
Dec......†	6.84	5.99	4.20	6.70	4.81	3.37	4.74	3.87	6.23	5.18	3.77	-	1.41	-	2.46

* According to a scale of 10 degrees of coloration of Schönbein's test-paper. Maximum of scale=10. The tinted scale is printed on page 142 of the Report of the State Board of Health for 1875.

† For November and December, 1879, and the year 1881, the observations were made by Harry B. Turner, at the office of the State Board of Health, Lansing.

EXHIBIT 27.—*Average Amount of Atmospheric Ozone (Day), by Year and Months, in 1881 compared with Annual and Monthly Averages for the 5 Years, 1877–1881.**

YEARS, ETC.	Ozone by Day.—Degrees of Coloration of Test-paper.†												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 years,—1877-1881.....	3.07	3.31	3.49	3.60	3.20	2.99	2.84	2.71	2.84	2.78	2.67	3.12	3.18
1877 — (10 Stations*).......	2.21	2.63	1.83	2.47	1.68	1.68	1.97	1.84	2.40	2.21	2.35	2.31	2.62
1878 — (11 Stations*)	3.37	3.81	4.24	4.18	3.53	3.43	3.11	2.78	2.77	2.77	3.07	3.21	3.55
1879 — (13 Stations*).......	2.85	3.62	3.58	2.49	3.12	2.85	2.24	2.28	2.30	2.48	2.44	2.87	2.89
1880 — (17 Stations*).......	3.25	2.54	3.69	3.68	3.83	3.33	3.25	3.14	3.00	2.78	2.29	3.30	3.53
1881 — (18 Stations*).......	3.68	3.94	4.12	4.16	3.82	3.63	3.63	3.51	3.74	3.66	3.18	3.43	3.32
In '81 **Greater** than Av. '77-81	.61	.63	.63	.56	.62	.64	.79	.80	.90	.88	.51	.31	.14

*Thornville, Kalamazoo, Mendon, and Tecumseh for five years 1877-81; also Battle Creek for 4 years 1877-80; Niles for 4 years 1878-81; Nirvana for 3 years 1877-9; Coldwater for 1877, 1878, 1880; Agricultural College for 1877, 1878, 1880; Otisville for 3 years 1878-80; Alpena, Lansing, and Washington for 3 years 1879-81; Petoskey and Woodmere Cemetery for 1878, 1879; Marquette, Grand Haven, and Ann Arbor for 1880, 1881; Fyfe Lake and Ypsilanti for 1877; Ionia and Adrian for 1880; Escanaba Harrisville, Reed City, Port Huron, Winfield, Marshall, and Hudson and Mallory Lake for 1881.

EXHIBIT 28.—*Average Amount of Atmospheric Ozone (Night), by Year and Months in 1881, compared with Annual and Monthly Averages for the 5 Years, 1877–81.**

YEARS, ETC.	Ozone by Night.—Degrees of Coloration of Test-paper.†												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 yrs, 1877-1881..........	3.06	3.80	3.96	4.23	3.52	3.02	2.82	2.31	2.11	2.28	2.84	3.47	3.51
1877 — (10 Stations*)	2.31	2.23	1.96	3.22	1.97	1.50	2.15	1.69	1.78	1.89	2.47	3.08	2.75
1878 — (11 Stations*)	3.43	4.13	4.38	4.49	3.38	3.68	2.88	2.40	2.22	2.57	3.26	3.36	3.95
1879 — (13 Stations*)	2.94	3.98	4.18	4.14	3.41	2.82	2.26	1.91	1.59	2.26	2.89	3.14	3.25
1880 — (17 Stations*)	3.13	3.84	4.75	4.69	4.37	3.89	3.35	2.77	2.40	1.88	3.13	3.75	4.11
1881 — (18 Stations*)	3.51	3.83	4.52	4.59	3.99	3.19	3.47	2.76	2.56	2.79	2.94	4.01	3.48
In '81 **Greater** than Av. '77-81	.45	.03	.56	.36	.47	.17	.65	.45	.45	.51	.10	.54	......
In 1881 **Less** than Av. 77-81	......	......	......	......	......	......	......	......	......	......	......	......	.03

*The stations represented in Exhibit 28 are the same as those represented in Exhibit 27, above, relative to day ozone, and named in the star foot-note to that exhibit.

TABLE VIII.—*Relative amount of Ozone in the Atmosphere, by day, during the Year and during each Month of the Year 1881, at 26 Stations in Michigan,—as Indicated by Averages of Observations made Daily by Exposing Test-paper prepared according to Schönbein's formula, from 7 A. M. to 2 P. M.—Recorded according to a scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by Ozone equals 10), by Observers for the State Board of Health and for the U. S. Signal Service.**

STATIONS IN MICHIGAN.* (Those of U. S. Signal Service in italics.)	Division of the State.*	Degrees of Coloration of Test-paper.—Day Observations. Years.			Months, 1881.											
		1879.	1880.	1881.	Jan.	Feb.	Mar.	Apr.	May.	J'ne.	J'ly.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 18 Stations †	......	‡	§	3.68	3.94	4.12	4.16	3.82	3.63	3.63	3.51	3.74	3.66	3.18	3.43	3.32
Marquette	U. P.	.....	2.62	3.57	3.19	3.29	2.84	3.20	3.35	3.47	4.45	3.7	3.40	1.68	3.83	4.00
Escanaba	U. P.	.....	.....	2.94	2.65	2.20	[a]2.43	2.47	3.62	2.50	2.48	2.87	2.98	3.23	3.43	4.58
Alpena	N. E.	3.06	2.60	3.61	4.07	4.57	3.68	4.00	4.13	3.67	3.63	4.77	4.27	3.42	2.70	2.94
Harrisville	N. E.	.....	.....	4.59	4.90	5.14	4.87	4.33	4.61	4.53	4.35	4.79	4.60	4.16	4.00	4.05
Grand Haven ..	W.	.....	4.04	3.83	4.39	4.43	5.06	3.43	3.64	4.07	3.29	4.00	3.77	3.74	3.20	2.68
Reed City	W.	2.65	3.96	4.29	3.16	3.32	4.65	[b]4.93	4.84	4.60	4.97	4.81	4.47	4.23	3.93	3.86
Port Huron	S. E.	.....	.....	3.30	3.90	3.36	3.87	3.27	3.62	3.33	2.87	3.77	3.70	3.00	2.27	2.58
Thornville		1.77	3.18	3.30	3.29	4.07	4.84	3.58	2.46	2.77	2.32	3.03	3.37	3.42	3.27	3.12
Hastings	C.	.....	.....	‖4.15	4.55	[a]4.91	5.08	4.70	3.71	[b]4.10	3.60	.....	[a]3.70	[b]3.21	[b]3.63	[b]3.97
Ionia	C.	.....	3.73	‖3.70	4.32	3.93	3.46	3.30	3.68	.....	.....	.....	.....	3.32	.....	3.68
Lansing, State B'd of Health.	C.	3.15	3.70	4.00	4.51	3.75	4.52	4.50	3.94	3.73	4.45	4.45	4.12	2.77	3.67	3.39
Otisville	C.	2.89	3.84	‖3.33	[d]4.79	.....	.....	.....	.....	.....	3.11	3.16	3.18	3.02	3.20	2.51
Winfield	C.	.....	.....	4.91	5.67	5.64	5.42	5.35	4.84	4.60	4.29	4.82	4.65	4.30	4.70	4.42
Niles	S. W.	3.22	3.36	3.10	3.39	3.29	3.42	3.33	2.64	3.67	3.45	3.63	3.27	2.67	2.90	[a]2.39
Adrian	S. C.	.....	2.28	‖3.21	1.67	3.04	[b]3.93	4.50	[a]3.43	[b]2.90	[b]2.83	.....	.....	.....	.....	.....
Ann Arbor	S. C.	.....	1.67	1.68	1.45	[d]2.04	[b]2.28	[b]2.03	[a]1.70	2.33	1.61	[b]1.66	1.27	1.56	[b]1.03	[c]1.21
Battle Creek ...	S. C.	2.22	3.37	‖2.49	3.00	3.29	3.45	3.23	2.84	2.63	2.68	.....	1.60	1.74	1.43	1.58
Coldwater	S. C.	.....	4.02	‖3.99	4.84	4.54	3.84	3.57	[a]3.77	.....	[b]3.39	.....	.....	.....	.....	.....
Hillsdale	S. C.	.....	.....	‖3.15	2.71	2.96	3.55	3.50	3.39	3.32	3.12	3.39	.....	.....	2.77	2.77
Kalamazoo	S. C.	2.49	2.63	3.21	3.77	4.00	3.66	3.53	3.16	3.73	3.03	3.06	3.07	2.23	2.70	2.61
Mallory Lake and Hudson ¶..	S. C.	.....	.....	3.00	3.65	4.04	3.87	3.43	2.94	2.97	2.55	[f]2.65	2.98	2.67	2.32	1.82
Marshall	S. C.	.....	.....	3.98	3.77	[d]4.11	[d]4.85	[c]4.00	[b]3.50	[d]4.19	[c]4.75	[b]4.10	[c]4.42	3.68	3.40	2.91
Mendon	S. C.	2.67	3.36	3.50	4.52	5.98	4.61	3.93	[a]3.17	2.73	2.29	2.84	[b]3.03	2.85	[c]3.46	3.13
Park	S. C.	.....	.....	4.19	4.81	5.14	4.55	3.50	3.39	3.67	4.13	4.19	3.83	3.97	4.77	4.32
Tecumseh	S. C.	3.10	3.36	4.30	[a]5.23	5.50	5.00	4.93	4.26	3.80	3.35	3.65	3.60	3.71	[b]4.45	4.10
Washington	S. E.	2.97	3.94	3.84	4.06	4.27	4.37	4.07	4.06	3.03	3.00	3.82	3.93	2.93	3.60	3.39

* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 267. The full names of the divisions and counties in each division are stated in Exhibit 7, page 445.

† An average for only the 18 stations for which statements are given for every month of the year, not including Mallory Lake and Hudson.

‡ For 13 stations in 1879, 2.85. § For 17 stations in 1880, 3.25. ‖ Not a statement for the year, but an average for the months in 1881 represented in this line.

[a] For 30 days. [b] For 29 days. [c] For 28 days. [d] For 27 days.
[e] For 24 days. [f] For 23 days. [g] For 22 days. [h] For 18 days.

¶ The observations compiled in this line were made at Mallory Lake until Aug. 1. After that date they were made by another observer at Hudson. Mallory Lake is two miles west and one and one-half miles south from Hudson.

Eighteen lines in this table are graphically represented in Diagrams XII. and XIII., pp. 489-490.

DIAGRAM XII.—OZONE, DAY, BY MONTHS, IN 1881.

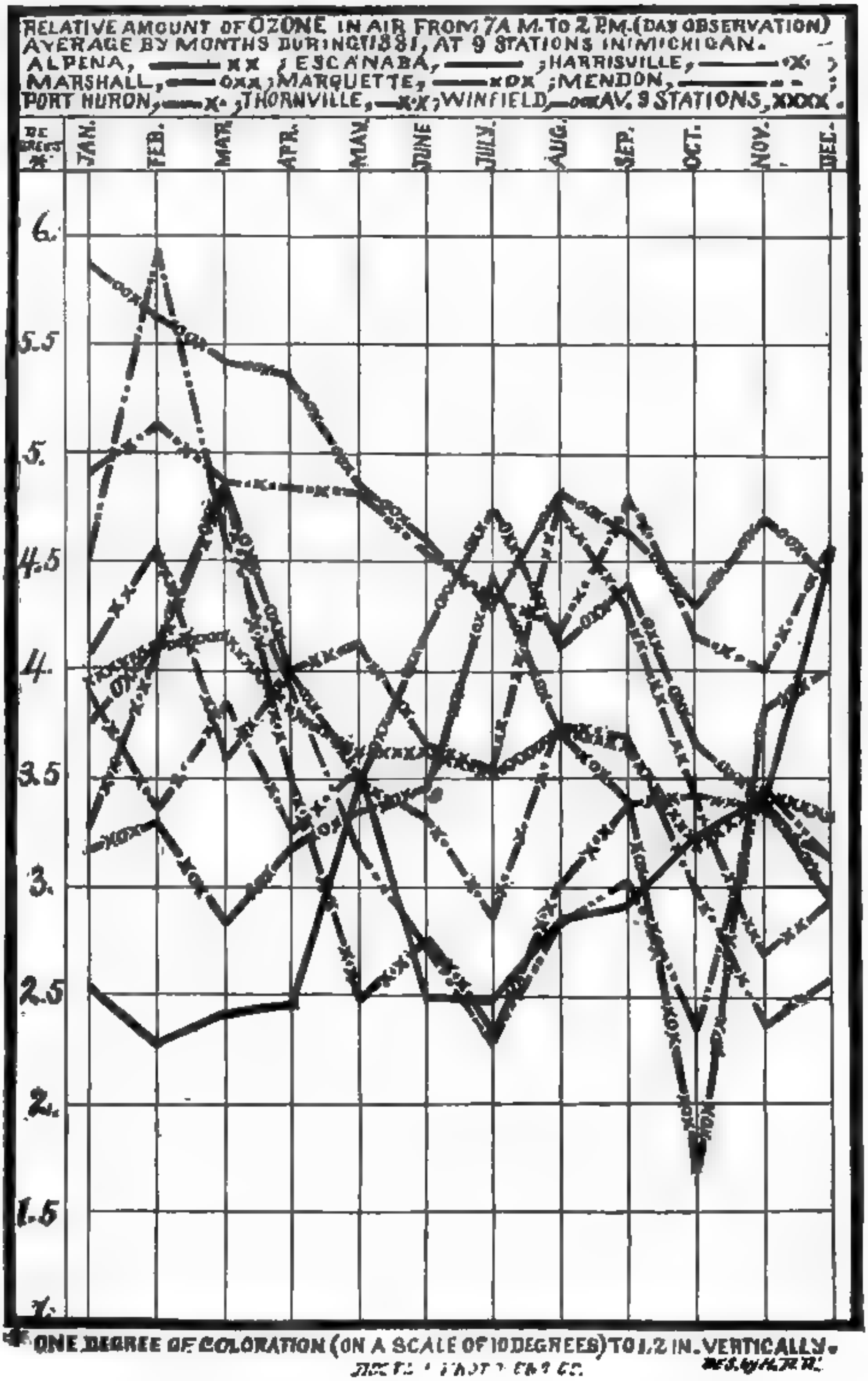
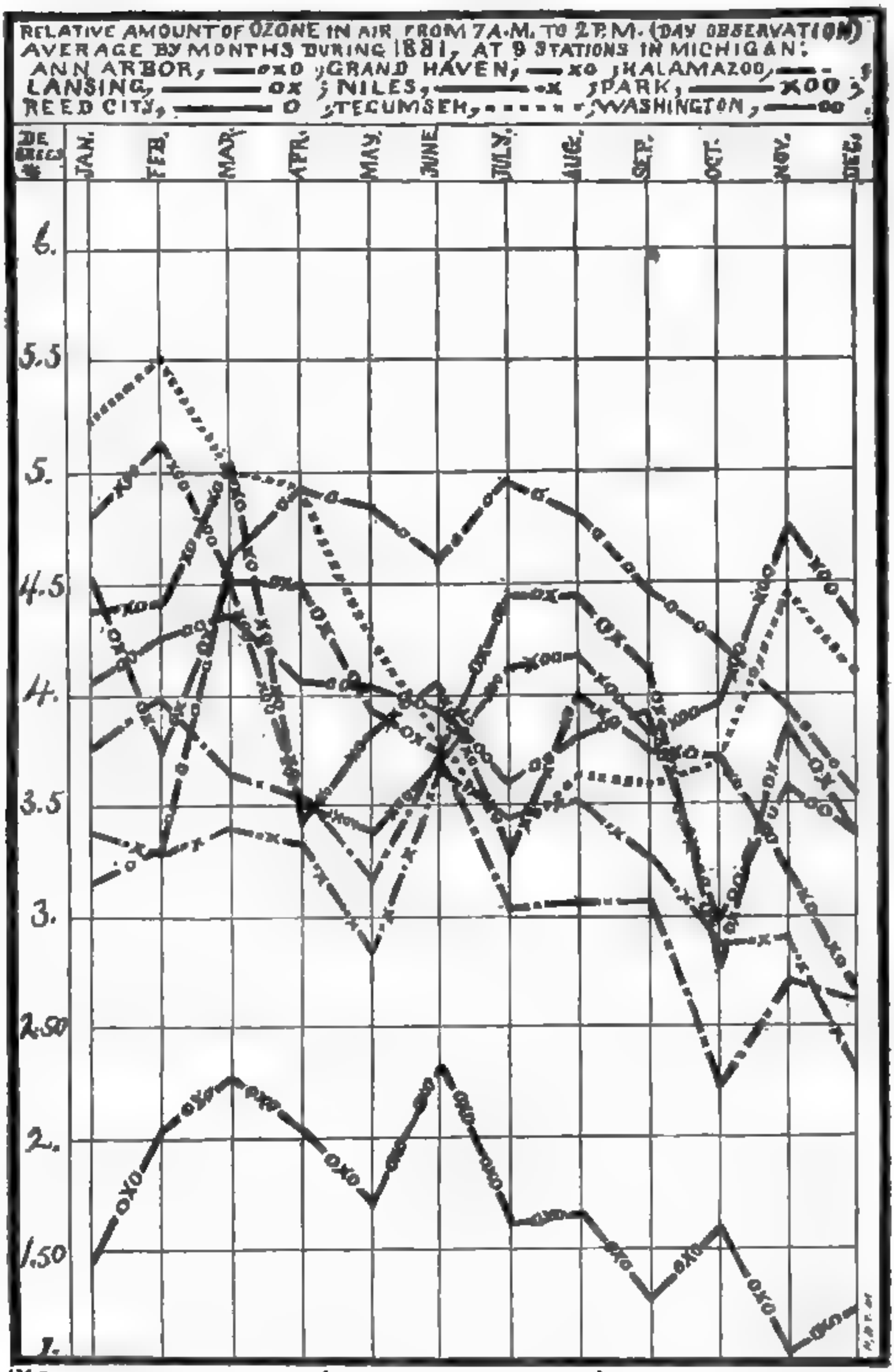


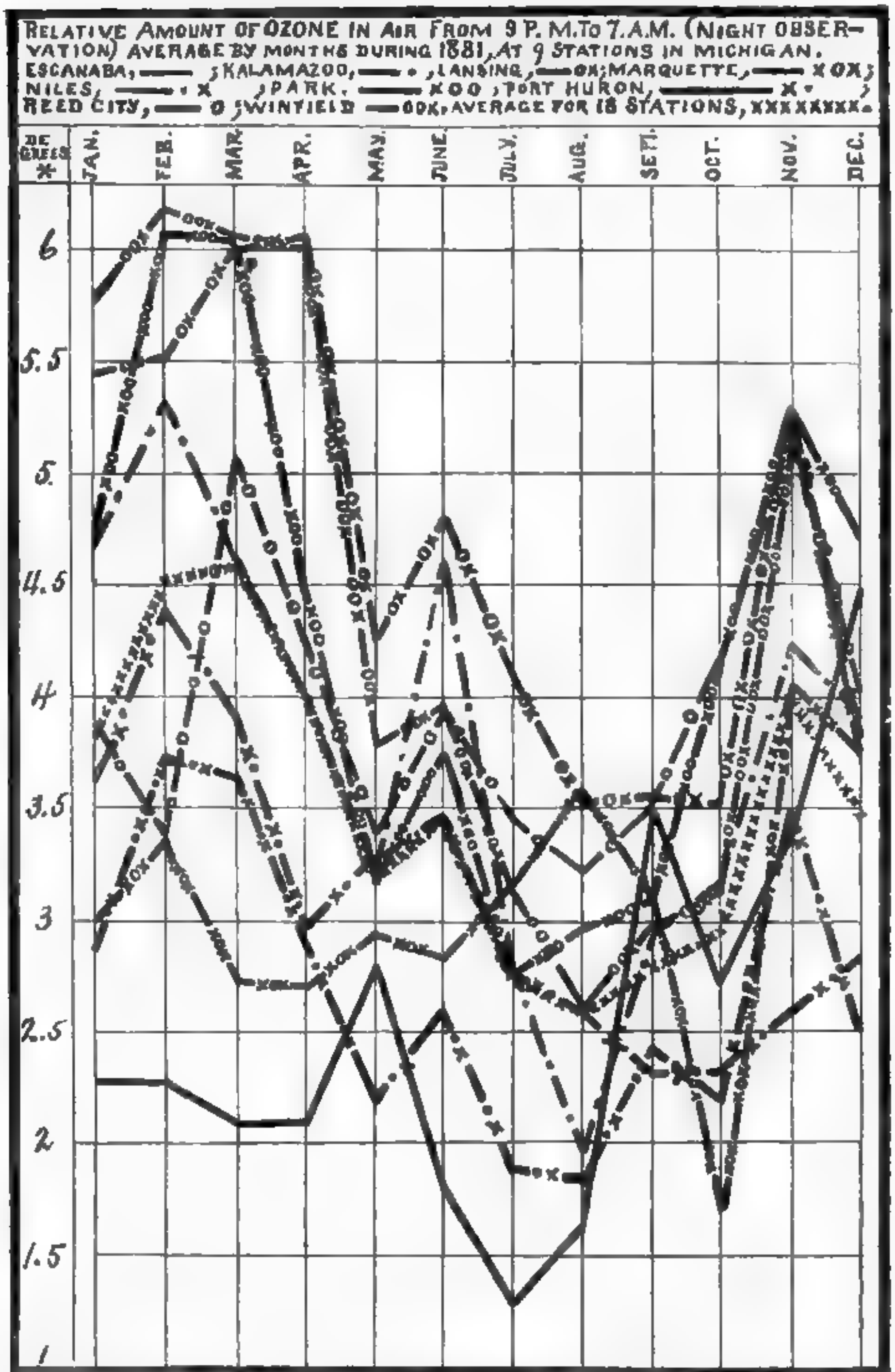
DIAGRAM XIII.—OZONE, DAY, BY MONTHS IN 1881.



*ONE DEGREE OF COLORATION (ON A SCALE OF 10 DEGREES) TO 1.2 IN. VERTICALLY.

BOSTON PHOTO-ENG. CO. DIS. by H.B.B.

DIAGRAM XIV.—OZONE, NIGHT, BY MONTHS IN 1881.



* SCALE, ONE DEGREE OF COLORATION (ON A SCALE OF 10 DEGREES) TO 1.2 INCHES VERTICALLY.

BOSTON PHOTO-ENG. CO.

DES. by H.B.B.

TABLE IX—*Relative amount of Ozone in the Atmosphere at Night, during the Year and during each Month of the Year 1881, at 26 Stations in Michigan,—as indicated by Averages of Observations made Nightly by Exposing Test-paper, prepared according to Schönbein's formula, from 9 P. M. to 7 A. M.—Recorded according to a Scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by Ozone equals 10), by Observers for the State Board of Health, and for the U. S. Signal Service.**

STATIONS IN MICHIGAN.* (Those of the U. S. Signal Service in italics.)	DIVISION OF THE STATE.*	DEGREES OF COLORATION OF TEST-PAPER.—NIGHT OBSERVATIONS.														
		YEARS.			MONTHS, 1881.											
		1879.	1880.	1881.	Jan.	Feb.	Mar.	Apr.	May.	J'ne.	J'ly.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 18 Stations †	......	‡	§	3.51	3.83	4.52	4.59	3.99	3.19	3.47	2.76	2.56	2.79	2.94	4.01	3.48
Marquette	U. P.	......	2.71	3.09	3.00	3.36	2.74	2.70	2.94	2.68	3.19	3.61	3.10	1.71	4.07	3.77
Escanaba	U. P.	......	......	2.63	2.79	2.26	[b]2.10	2.10	2.81	1.80	1.29	1.65	3.50	2.71	3.40	4.46
Alpena	N. E.	3.02	1.69	3.12	3.00	4.13	3.68	3.40	3.46	3.20	2.81	2.65	2.93	2.64	2.57	2.67
Harrisville	N. E.	......	......	4.70	5.48	5.46	5.10	5.10	3.87	4.63	4.19	3.77	4.80	4.35	5.17	4.94
Grand Haven	W.	......	3.94	3.92	4.89	4.79	5.10	4.30	3.90	3.77	4.35	2.87	3.15	4.32	3.83	2.39
Reed City	W.	2.51	3.71	3.96	3.87	3.59	5.06	[b]4.24	3.39	3.93	3.45	3.23	3.50	4.19	5.20	[a]4.05
Port Huron	E.	......	......	3.09	3.61	4.39	3.90	2.97	3.29	2.47	2.77	2.58	2.30	2.32	2.60	2.84
Thornville	E.	2.68	3.46	3.56	3.61	5.07	5.16	3.77	2.65	3.40	2.35	2.58	2.83	3.56	4.43	3.32
Hastings	C.	......	......	4.16‖	4.71	[b]4.48	6.85	5.40	[a]3.00	[b]4.24	2.40	......	[b]2.88	3.10	4.93	4.29
Ionia	C.	......	4.02	3.60‖	4.48	2.82	3.55	3.40	3.00	......	......	......	......	3.32	......	3.61
Lansing, State B'd of Health	C.	3.56	4.14	4.66	6.45	5.54	6.00	6.07	4.26	4.80	4.10	3.53	3.57	3.52	5.80	3.77
Otisville	C.	3.13	3.71	3.51‖	6.48	......	......	......	......	......	2.77	2.19	2.57	3.29	3.73	3.59
Winfield	C.	......	......	4.38	5.77	6.16	6.06	6.00	3.79	3.97	3.13	2.60	2.96	3.13	5.13	3.81
Niles	S. W.	3.14	2.98	2.69	2.87	3.75	3.65	2.90	2.19	2.60	1.87	1.84	2.43	2.19	3.00	[a]2.50
Adrian	S. C.	......	2.06	2.95‖	[a]2.03	3.32	[h]4.55	3.63	[a]2.43	[b]2.90	1.77	......	......	......	......	......
Ann Arbor	S. C.	......	1.74	2.00	[a]1.00	[d]2.78	[b]2.86	[b]2.48	2.13	[f]2.48	[b]1.36	1.56	1.70	[a]1.53	[c]2.71	[c]1.96
Battle Creek	S. C.	2.09	2.80	2.52‖	2.87	3.54	3.23	3.83	2.90	2.70	2.56	......	1.80	[a]1.80	1.45	1.48
Coldwater	S. C.	......	3.66	3.93‖	3.87	[d]4.83	[a]3.63	4.00	[a]3.93	......	[i]3.83	......	......	......	......	......
Hillsdale	S. C.	......	......	3.34‖	2.55	3.29	4.45	3.63	3.26	2.83	2.54	3.10	......	......	3.93	3.35
Kalamazoo	S. C.	2.65	3.02	3.79	4.66	5.32	4.61	4.00	3.23	4.60	2.77	1.97	2.93	3.19	4.23	3.94
Mallory Lake and Hudson**	S. C.	......	......	3.04	3.94	4.36	4.71	4.40	2.58	3.07	2.19	[g]2.61	2.00	1.50	2.77	2.39
Marshall	S. C.	......	......	3.03	2.87	4.00	[d]5.07	[f]3.60	[e]2.73	[e]3.35	[f]2.02	[b]2.76	[g]1.96	[a]1.67	3.23	2.65
Mendon	S. C.	2.79	3.23	3.26	3.63	[d]5.79	[a]5.63	4.43	[b]2.69	2.63	1.61	1.90	[b]2.17	2.23	[b]3.97	[b]3.41
Park	S. C.	......	......	4.27	4.74	6.07	6.09	4.50	3.16	3.77	2.74	2.97	3.10	4.15	5.30	4.71
Tecumseh	S. C.	3.08	2.91	3.60	4.80	4.67	5.35	4.93	3.30	3.57	2.06	1.65	1.77	2.94	4.20	4.52
Washington	S. E.	3.07	3.53	3.47	4.42	4.43	4.48	4.52	3.47	3.63	2.68	2.30	2.10	2.10	3.65	3.72

* The names of Observers, their places of observation, and the counties in which those places are situated, are stated in Exhibit 7, page 445. The full names of the divisions and the counties in each division are stated in Exhibit 1, page 287.

† This line is an average for only the 18 stations for which statements are given for every month of the year, not including Mallory Lake and Hudson.

‡ For 13 stations in 1879, 2.94. § For 17 stations in 1880, 3.13.

‖ Not a statement for the year, but an average for the months in 1881 represented in this line.

** The observations compiled in this line were made at Mallory Lake until August 1. After that date they were made by another observer at Hudson. Mallory Lake is two miles west, and one and one half miles south from Hudson.

[a] For 30 days. [b] For 29 days. [c] For 28 days. [d] For 27 days. [e] For 26 days.
[f] For 25 days. [g] For 23 days. [h] For 21 days. [i] For 18 days.

DIAGRAM XV.—OZONE, NIGHT, BY MONTHS IN 1881.

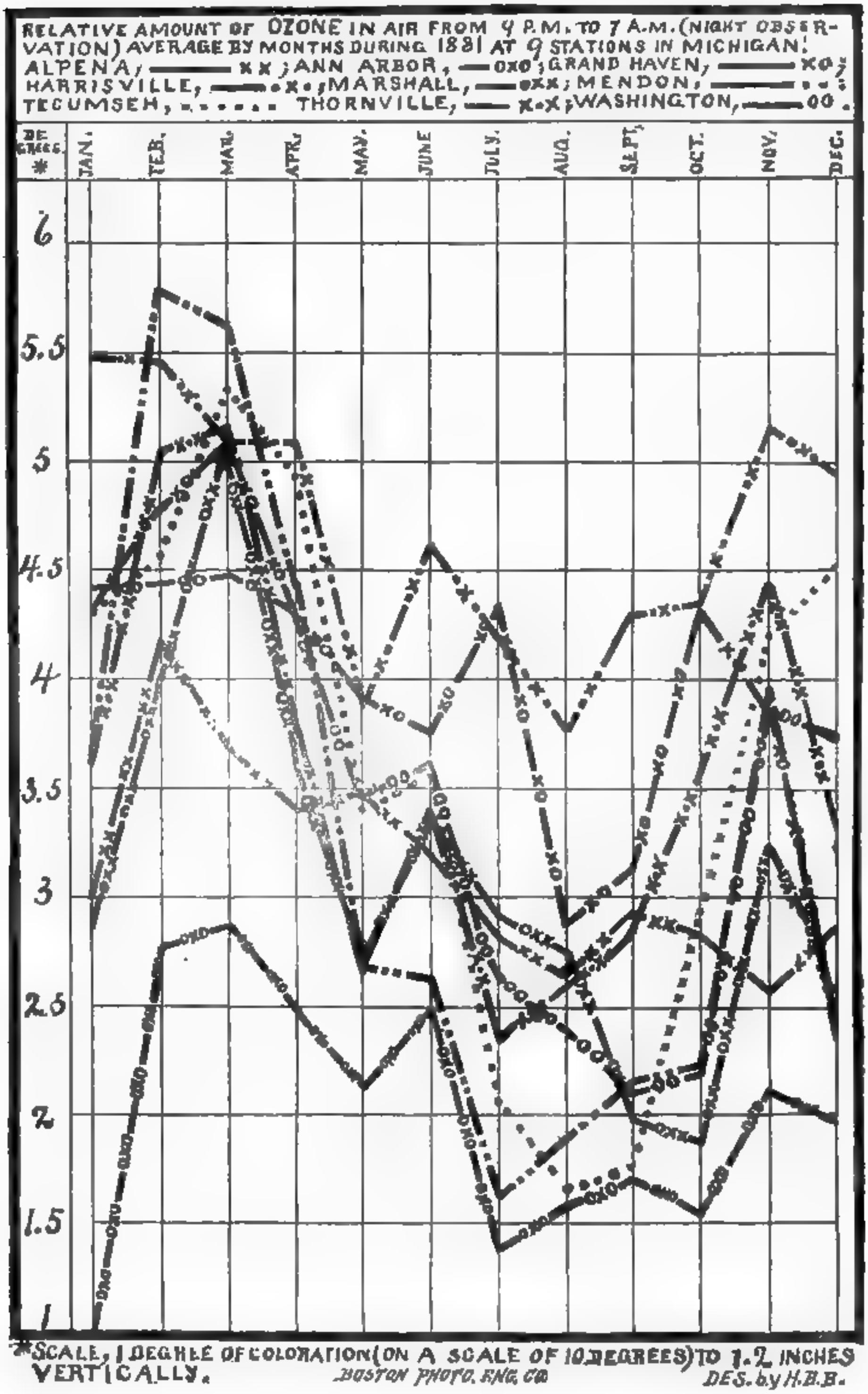


EXHIBIT 29.—*Ozone at Lansing, Michigan, in 1879, 1880, and 1881, by year and months, Compiled from Records of Three Daily Observations at the Office of the State Board of Health.*

YEAR AND MONTHS.	Degree of Coloration of Test-paper.*											
	1879.				1880.				1881.			
	Aver-ages.	7 A. M. to 2 P. M.	7 A M. to 2 P. M.	9 P. M to 7 A. M.	Aver-ages.	7 A. M. to 2 P. M.	2 P. M. to 9 P. M	9 P. M. to 7 A. M.	Aver-ages.	7 A. M to 2 P. M.	2 P. M. to 9 P. M.	9 P. M. to 7 A. M.
Year	3.35	3.14	† 3.37	3.58	3.74	3.70	3.36	4.14	4.09	4.00	3.59	4.66
January	3 62	3.36	....	3.87	2.84	2.90	2.45	3.16	4.64	4.52	3 94	5.45
February	4.09	3.41	....	4.77	4 38	4.38	3 79	4.97	4 42	3.75	3.96	5.54
March	4.15	3.79	....	4.50	3.69	3.42	3.34	3.81	5.02	4.52	4.55	6.00
April	2.71	2.62	....	2.80	4 41	4.28	4.02	4.93	4.89	4.50	4.10	6.07
May	2.75	2.69	....	2 80	3.97	3.81	3 77	4.32	3.85	3.94	3.35	4 26
June	2.29	1.97	....	2.60	3.63	3.53	3 50	3.87	3.92	3.73	3.23	4.80
July	3.55	3.81	3 27	3 56	3.40	3.39	3.19	3.61	4.05	4.45	3.61	4.10
August	3.29	3.74	3.65	2.48	2.77	2.90	2.55	2.87	3.82	4.45	3.48	3 53
September	3.25	3.17	3.07	3.50	3.28	3.73	2.50	3 60	3.69	4.12	3 87	3.57
October	3.13	2.73	3.13	3.52	3.16	3.19	2.58	3.71	2.98	2.77	2.65	3.52
November	4.05	3.53	4.00	4.63	4.77	4.33	4.37	5 60	4.33	3.87	3.83	5.30
December	3.31	2.97	3 10	3.87	4.54	4.55	3.81	5.26	3.41	3 39	3.06	3.77

* By a scale of 10 degrees of coloration of Schönbein's test-paper, maximum of scale = 10°.
† Average for six months.

OZONE TESTS AS INFLUENCED BY WIND AND BY FURNACE GASES.

The regular tri-daily observations of ozone at the office of the State Board of Health have been made on the south side of the west wing of the Capitol, at a place somewhat sheltered from north, northeast, east, and southeast winds. At this point, too, when the wind was in those directions, the test-paper was more exposed to emanations of foul air from the building, and especially from the furnace chimneys and the outlets of the foul-air shafts, at the top of the building. Anthracite coal is burned in the furnaces. The odor of sulphurous acid gas is not infrequently noticed at the level of the main floor. This gas bleaches Schönbein's test-paper after it has been colored by ozone. In order to ascertain what influence this protection from north, northeast, east and southeast winds and simultaneous greater exposure to furnace gases, etc., had on the results obtained, special observations were made when the wind was blowing from either of those directions (during the last eleven months of the year 1881) on the side of the building then more exposed to the wind and less exposed to emanations from the building (for the most part at the north end of the north wing). The results of those observations are summarized in Exhibit 30, page 496, and compared with results of simultaneous observations at the regular place of observation. In the 5th, 10th, and 15th figure-columns of this Exhibit is also stated the average of observations for he full month at the regular place of observation. Except for the night ob-ervation (9 P. M. to 7 A. M.) in September, the average of observations on the

side of the capitol most exposed to wind at the time of observation is greater than the average of observations made at the same time on the side least exposed.

By reference to the Exhibit (30) it may be seen that the difference between results by the regular and by the special exposed observations is generally less in the warm months, July, August, and September, than in the colder months. In the warm months but little fire is kept in the furnaces, hence less sulphurous acid gas, and other substances which might bleach the test-paper, are thrown into the air to fall on the side of the building protected from the wind. The difference between the averages of the regular and of the special more exposed observations is also, as a rule, greater by the day observations (7 A. M. to 2 P. M. and 2 P. M. to 9 P. M.) than by the night observations (9 P. M. to 7 A. M.), apparently because in the night the fires are not kept up so much as during the day, and generally not so many persons are in the building at night.

As a general rule observations of ozone show a greater coloration of the test-paper during winter than during summer months, with a greater difference between the cold and the warm months than appears in either of the columns for full months in Exhibits 30. It now appears probable that on account of the exposure of the test-paper to gases from the furnace, and to other impure air from the building, and on account of its varying exposure to the wind, the columns for full months in Exhibits 30 and 29, also the line for Lansing in Tables VIII and IX, and in Diagrams 13 and 14, are not perfect indications of the general amount of ozone in the air. The error is probably greater in the lines and columns for day observations (7 A. M. to 2 P. M., and 2 P. M. to 9 P. M.) than in those for night observations (9 P. M to 7 A. M.), and in the cold than in the warm months. For 1882 a full series of observations was made at the north end of the Capitol. It is hoped for 1883 to make an independent series of observations at a point more removed from the influence of the Capitol building.

The comparison of ozone observations made in Exhibit 30, besides what it teaches of the disturbance of local influences on observations for atmospheric ozone, has a direct bearing on questions relating to the health of those who work in the capitol, and on the construction and management of similar large buildings. Human lungs are probably not less sensitive to sulphurous acid gas, and to air contaminated with other gases, than is ozone test-paper. The fresh-air ducts of the Capitol on the leeward side are fed by such air as that to which the test-paper has been exposed when on the leeward side of the building; and the depressing and the irritating influence of the air in rooms on the leeward side of the building has been noticed. That these influences were not altogether matters of imagination would seem to be proved by the comparison in Exhibit 30, even though they should be found to be in part due to variations in the draft in the foul-air flues, dependent in part on the direction of the wind. It cannot be that air so loaded with unwholesome gases as these ozone tests show the air on the leeward of this large building to be, at times, can be wholesome air to breathe, even when the sense of smell fails to detect the presence of sulphurous acid gas; and at infrequent times the air coming in at the fresh air ducts has been sensibly loaded with such gas. Perhaps the conditions might be improved by raising the smoke flues and ventilating ducts so that the air from the furnaces and foul-air shafts should be thrown into the air at a higher point and above the current of air which sweeps over the top of the building. Another remedy would be such an

arrangement of the fresh-air ducts that the air should be taken into the building always from the windward side.

In comparing results of observations of ozone by day and by night, in this Report, it should be remembered that the test-paper is exposed 10 hours for the night observation (from 9 P. M. to 7 A. M.), and but 7 hours for each of the day observations. This longer exposure at night may at some times result in a greater coloration of the test-paper, and at other times in a greater bleaching of the paper, on account of variations in the humidity of the air, and in other conditions which might affect the test. It is well known that the greatest degree of coloration does not always occur at the latest hour of exposure. Experiments and deductions therefrom by Dr. A. W. Nicholson, relative to influence of humidity on Schönbein's test for ozone are printed on pages 295–302 of the Report of the State Board of Health for 1880. Investigations to ascertain the relative amount of ozone in the atmosphere at different times are attended with many difficulties, but very much has already been learned by the systematic observations, in this State, and there is prospect of gaining still more valuable information by a continuation of the efforts.

EXHIBIT 30.—*For Eleven Months in 1881, Comparison of Special Ozone Observations made on the side of the Capitol more directly exposed to the Wind at the time of Observation, with the Regular Observations made at the same time;—also Average of the Regular Observations for the same Months.—Observations made at the Office of the State Board of Health, Lansing.**

MONTHS, 1881.	9 P. M. to 7 A. M. Observations.				Coloration by Regular 9 P. M. to 7 A. M. Observations for Full Month.	7 A. M. to 2 P. M. Observations.				Coloration by Regular 7 A. M. to 2 P. M. Observations for Full Month.	2 P. M. to 9 P. M. Observations.				Coloration by Regular 2 P. M. to 9 P. M. Observations for Full Month.
	No. of Observations Averaged for Comparison.	Average Degree of Coloration.				No. of Observations Averaged for Comparison.	Average Degree of Coloration.				No. of Observations Averaged for Comparison.	Average Degree of Coloration.			
		By Regular Observations.	By Observations More Exposed to Wind.	Greater (+) or Less (-) by Exposed than by Regular Observations.			By Regular Observations.	By Observations More Exposed to Wind.	Greater by Exposed than by Regular Observations.			By Regular Observations.	By Observations More Exposed to Wind.	Greater by Exposed than by Regular Observations.	
Av. 11 mo's	109	3.27	4.81	+ 1.54	4.59	26	2.49	4.59	2.10	3.93	121	2.16	4.01	1.85	3.56
February...	8	3.00	6.13	+ 3.13	5.54	12	1.58	5.25	3.67	3.75	11	2.00	4.73	2.73	3.96
March.......	12	4.33	7.25	+ 2.92	6.00	15	2.27	6.00	3.73	4.52	14	2.50	6.29	3.79	4.55
April........	8	4.25	6.38	+ 2.13	6.07	9	1.33	5.33	4.00	4.50	10	2.10	4.80	2.70	4.10
May..........	9	3.33	4.44	+ 1.11	4.26	9	2.00	5.33	3.33	3.94	9	2.33	3.78	1.45	3.35
June........	17	4.12	5.47	+ 1.35	4.80	17	2.82	5.35	2.53	3.78	16	2.75	5.06	2.31	3.23
July.........	9	3.56	4.00	+ .44	4.10	12	4.17	4.92	.75	4.45	11	2.91	4.09	1.18	3.61
August.....	17	3.18	3.53	+ .35	3.58	20	4.30	5.00	.70	4.45	11	3.12	3.71	.59	3.48
September.	7	2.14	2.00	- .14	3.57	7	4.07	4.93	.86	4.12	7	3.14	3.86	.72	3.37
October....	10	2.30	3.90	+ 1.60	3.52	13	1.77	3.85	2.08	2.77	15	1.93	3.13	1.20	2.05
November..	4	4.75	6.00	+ 1.25	5.50	4	2.50	2.50	.00	3.87	3	.33	3.33	3.00	3.53
December..	6	1.06	3.30	+ 1.24	3.77	7	.57	2.14	1.57	3.39	7	.43	1.29	.86	3.06

*By a scale of 10 degrees of coloration of Schönbein's test-paper,—maximum of scale = 10.

OZONE AT DIFFERENT HEIGHTS.

It is believed by some that ozone is more abundant at great heights in the air than at the surface of the ground, because more ozone may be formed in the upper air and because of its rapid combination with the more abundant impurities of the lower air. In Exhibit 31, page 498, are stated results of a series of tri-daily observations for the 30 days from July 18 to August 16 (inclusive), 1881, at three heights, namely, on the north side of the "lantern" above the dome of the Capitol, about 220 feet from the ground; on the north side of the dome, about 116 feet from the ground, and near the level of the main (second) floor, about 17 feet from the ground. At the lower level two sets of observations were made, one at the usual place of observation, the other on the side of the Capitol most exposed to the wind at the time of observation. At the lantern and the dome, observations were made both with moistened paper and with dry paper; at the floor the observations were all with test-paper moistened at the time of exposure, in the usual manner.

The observations with moistened paper at each place indicate most ozone at the exposure from 7 A. M. to 2 P. M., and least at the exposure from 2 P. M. to 9 P. M. They also indicate slightly more at the height of the lantern than at the lower places, and a very little more at the base of the dome than (by regular observations) at the floor. The averages of the observations for the 30 days are stated in Exhibit 31, page 498. As regards single simultaneous observations at the different heights the coloration of the test-paper was sometimes the same at all three heights, often the same at two heights, seldom greater at the lower of two heights; the difference between coloration at two heights was seldom more than one degree, never more than three degrees, and but twice more than two degrees. The greater differences could generally be explained by differences in exposure on account of direction of wind rather than by difference in height. As the coloration was recorded according to a scale of but ten degrees of coloration of the test-paper and no fractions were recorded, it seems probable that differences in coloration may in some cases have been magnified, and in other cases disregarded in the record.

The dome is directly over the center of the Capitol. Furnace shafts open at the extremity of the north and of the south wings, the nearest one being about 145 feet distant; these, however, were not much used during July and August. Ventilating shafts open upon the roof at the N. E., N. W., S. E., and S. W. of the dome; the two nearer shafts are situated below and at the right and left of the slip exposed near the base of the dome, each one being about 50 feet distant. Allowing for the occasional influence of foul-air currents, we may infer that the slip at the base of the dome sometimes registered too low. It is possible that the observation at the lantern was affected by currents of impure air ascending within the dome and escaping at the windows of the lantern. The average velocity of the wind during the month was over eight miles per hour, and ascending currents of foul air outside of the dome were probably diffused and blown away before reaching the slip exposed 124 feet above the foul-air shafts. In other respects the places of observation were favorable, the atmosphere in the vicinity of the Capitol being usually, though not always, free from furnace smoke and other gaseous impurities.

The results of these observations seem to agree with observations made by John Mulvany, M. D., R. N., of England, and reported by him in a paper on "Ozone in Nature," page 282 of the Report of the Michigan State Board of Health for 1880. He found ozone more abundant at the height of the flag-

staff, and at the maintop, than on the upper deck of a vessel. Making allowance for different exposure to wind and to air from the large occupied Capitol building, the observations compiled in Exhibit 31 do not prove a great, but do prove nearly a constant difference in respect to ozone between the surface air and that 200 feet above the ground. For purposes of comparison, observations are needed at other places and entirely away from air subject to contamination by furnaces, sewers, dwellings, etc.

EXHIBIT 31.—OZONE AT DIFFERENT HEIGHTS.—*Coloration of Schonbein's Test-paper for Atmospheric Ozone, Average of Tri-daily Observations for the 30 Days from July 18 to August 16 (inclusive), 1881, made above the Dome,* near the base of the Dome,† and near the level of the Main (second) floor‡,§ of the State Capitol, Lansing, Michigan, by the Observer at the Office of the State Board of Health.*

METHOD OF OBSERVATION.	AV. DEGREE OF COLORATION OF TEST-PAPER.—(MAXIMUM = 10.)¶															
	Av. of the 3 Daily Observations (9 P. M. to 7 A. M., 7 A. M. to 2 P. M., 2 P. M. to 9 P. M.)				Exposed from 9 P. M. to 7 A. M.				Exposed from 7 A. M. to 2 P. M.				Exposed from 2 P. M. to 9 P. M.			
			At level of Main (2d) Floor.				At level of Main (2d) Floor.				At level of Main (2d) Floor.				At level of Main (2d) Floor.	
	Above Dome.*	Near Base of Dome.†	By Regular Observations.‡	By Observations more Exposed to Wind.§	Above Dome.*	Near Base of Dome.†	By Regular Observations.‡	By Observations more Exposed to Wind.§	Above Dome.*	Near Base of Dome.†	By Regular Observations.‡	By Observations more Exposed to Wind.§	Above Dome.*	Near Base of Dome.†	By Regular Observations.‡	By Observations more Exposed to Wind.§
With wet slip¶.	4.45	4.16	4.11	4.37	‖4.70	4.97	4.03	4.30	4.73	4.40	4.60	4.67	4.07	3.80	3.80	4.08
With dry slip¶.	3.75	3.46	.....	.....	‖4.18	3.63	.....	....	3.67	3.63	.....	.....	3.40	3.13	.....	.....

* On north side of the "lantern," about 220 feet from the ground.
† On north side of the dome, about 116 feet feet from the ground, and 20 feet above the roof of the main building.
‡ On south side of west wing of Capitol, about 17 feet from the ground.
§ On side of the Capitol most exposed to wind at time of exposing the test-paper, about 17 feet from ground.
‖ Includes probable correction for one observation in which the color was washed away by rain; excluding that observation the average is 4.55 for the wet slip and 3.97 for the dry.
¶ The usual method of making observations with Schonbein's test-paper, in this State, is to wet the paper at time of exposure, and again when (after exposure) the paper is compared with the scale to determine the degree of coloration. For comparison, a second line is given in this exhibit stating results of observations with paper not moistened at time of exposure. Unless otherwise stated in this Report, as in the articles on Meteorological Conditions in Michigan in previous Reports of the State Board of Health, the tables and exhibits relating to ozone are compiled from observations made with the moistened paper.

DIAGRAMS RELATING TO METEOROLOGICAL CONDITIONS.

In explanation of the diagrams in this paper (and of those in the following paper, relating to diseases), it may be stated that they are to be read by tracing each irregular line across the diagram from left to right, and noting at what point it intersects each of the perpendicular lines having the name of a month at the top. What station is represented by the horizontal line may be learned from the head of the diagram. The degree or value denoted by the intersection may be learned by referring to the figures in the left-hand margin. Thus in Diagram I., page 455, relating to average temperature in 1881, tracing the continuous line———, representing Escanaba, it may be seen that the average temperature at Escanaba was in January about 7°, in February about 13°, in April about 32°, in July about 70°, in Oct. about 45°,

etc. Exact statements for each month at each station may be found in Table I., pages 456–7; and accompanying each diagram is a table giving exact numerical statements for the conditions represented. The lines in the diagrams give more ready general comparisons of stations with each other, or of months with each other, than is possible from the mere numerical statements. The average line given in each table is in the corresponding diagram represented by an × line, thus × × × × × ×. The average line represented in diagram I., page 455, is the average for 20 stations given in Table I., page 456, and not an average for 7 stations, as stated in the head of the diagram.

By Diagram I., page 455, relating to average temperature in 1881, two peculiarities of the year 1881 may be noted, the low temperature in January and February, and the low temperature again in June. The course of the lines also suggests that the temperature was high in September and December. These indications are confirmed by reference to Exhibit 12, page 454. By this exhibit it may be seen also that the temperature was lower than usual from January to April inclusive, higher in May, lower again in June, and higher in August, September, November, and December.

Diagrams XVIII., XIX., and XX., pages 505 and 503, relating to direction of the wind, are to be read in a somewhat different manner. The single figures or separate groups of lines are designed to indicate by their length the number and the proportion of regular observations at 7 A. M., 2 P. M., and 9 P. M.* daily, at which the wind was blowing from each of the eight principal points of compass at the places and for the periods of time stated in the margin; and by their direction on the page, the direction of the wind. Each figure consists of lines drawn to a common center from some or all of the following directions on the page, and indicating that at the times of observation the wind blew from points of the compass as follows: Lines toward the common center from the top of the page indicate observations that the wind was blowing from the north; from the right-hand side, observations that the wind was from the east; from the bottom of the page, that it was from the south; from the left-hand side, that it was from the west; from the upper left-hand corner, that it was from the north-west; from the upper right-hand corner, that it was from the north-east; from the lower right-hand corner, that it was from the south-east; from the lower left-hand corner, that it was from the south-west. The number of regular observations at which the wind was blowing from the direction denoted by a line is indicated by the length of that line, .01 of an inch being the unit, or the length of line for one observation. The circles indicate calms, the number of regular observations at which there was no wind being denoted by the length of the *radius* of the circle drawn about the point of convergence of the lines for a given place or period of time, the length for one observation being, as before, .01 of an inch.

By Diagram XVI., page 502, or the third figure column in Table X., page 500, it may be seen that at Lansing the average velocity of the wind for the month of November (14.6 miles per hour) was greater than for any other month in 1881. By Diagram XX., page 503, or by Table XIII., page 509, it may be seen that for that month the prevailing direction of the wind at Lansing was west and south-west (W. at 26 and S. W. at 24 observations of 90 tri-daily observations for the month). These statements illustrate the reading of the diagrams for any use it may be desired to make of the tables and diagrams.

* At the stations of the U. S. Signal Service after June 30, 1881, the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington time.

TABLE X.—*Average velocity of the Wind, in Miles per Hour, during each Hour of the Day, by Months, for the Year 1881.—Compiled from Registers of the Robinson's Self-Registering Anemometer in the office of the State Board of Health, State Capitol, Lansing, Michigan.*

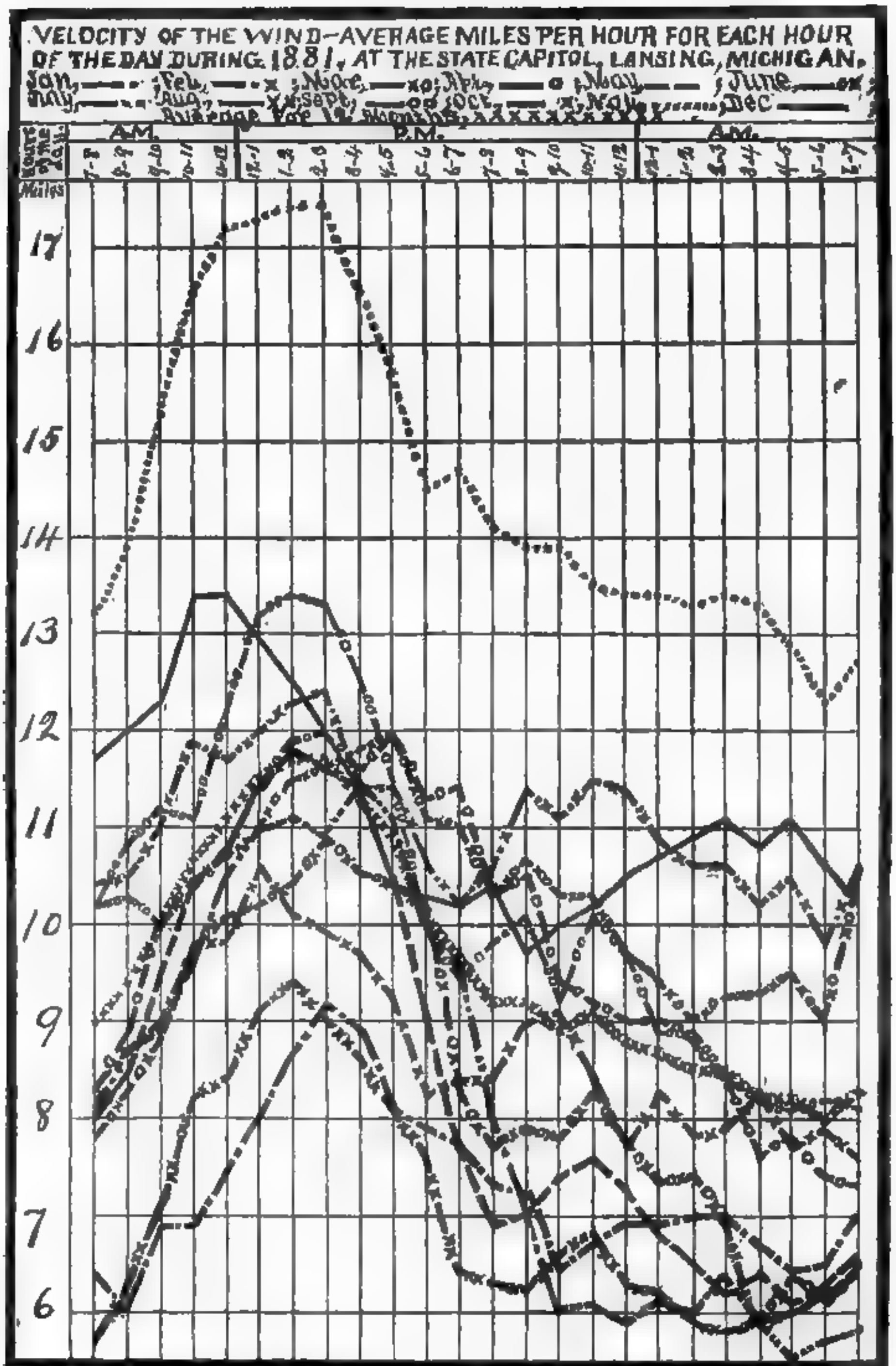
MONTHS.	AVERAGE.			HOURS (1881), AND AVERAGE MILES PER HOUR. A. M.					P. M.					
	1879.	1880.	1881.	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6
Year...	*	9.5	9.6	9.0	*9.4	10.0	10.7	11.1	11.5	11.7	11.7	11.5	10.9	10.1
January......	......	7.0	7.3	6.4	6.0	6.9	6.9	7.5	8.0	8.7	9.2	8.9	8.1	7.9
February	......	12.6	11.0	10.4	10.5	11.0	11.9	11.7	12.0	12.5	12.4	11.4	11.4	10.6
March	12.4	12.8	10.4	10.2	10.3	10.0	10.5	10.7	11.0	11.5	11.6	11.8	12.0	11.1
April	9.6	13.8	9.8	9.3	8.9	10.0	10.4	10.7	11.4	11.9	12.0	11.6	12.0	11.8
May	7.4	10.	8.4	8.0	8.5	9.5	10.4	10.8	11.4	11.6	11.8	11.4	10.5	9.0
June	6.8	8.3	8.4	7.8	8.3	8.8	9.8	10.1	10.2	10.4	10.9	10.5	10.4	10.2
July	8.6	6.5	8.1	8.0	8.7	8.9	9.6	10.5	11.0	11.1	10.9	11.4	11.1	10.0
August.......	8.4	5.9	7.0	6.	6.2	7.1	8.2	8.4	9.1	9.4	9.0	8.6	8.1	7.6
September....	10.0	8.1	10.3	10.	10.6	11.2	11.1	12.2	12.2	12.4	12.3	12.5	11.5	9.9
October	10.2	7.8	8.7	8.3	8.7	9.0	9.8	9.8	10.6	10.1	9.9	9.7	9.2	8.2
November ...	12.2	8.6	14.6	13.2	13.9	15.3	16.5	17.2	17.3	17.4	17.4	16.5	15.7	14.5
December....	11.3	7.4	11.2	1.7	12.0	12.3	12.4	12.4	13.0	12.5	12.0	11.4	10.4	10.3

MONTHS.	P. M.						A. M.						
	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7
Year...	9.6	9.2	9.2	8.9	9.1	8.8	8.7	8.5	8.5	8.2	8.3	8.0	8.1
January......	7.7	7.8	7.2	6.4	6.7	6.9	6.9	7.0	7.0	6.7	6.4	6.5	7.0
February	10.2	10.6	11.4	11.1	11.6	11.6	10.9	10.6	10.8	10.2	10.5	9.8	10.6
March	11.0	10.8	10.7	10.3	10.3	9.7	9.4	9.0	9.3	9.3	9.5	9.0	10.6
April	11.4	10.8	10.5	9.4	9.2	9.0	9.0	8.9	8.4	7.0	7.8	7.4	7.8
May	7.7	6.9	7.0	7.4	7.6	7.3	6.8	6.5	6.2	6.4	6.1	6.8	6.6
June	8.2	7.7	7.0	7.8	8.8	7.8	7.3	7.4	6.0	5.9	6.4	6.1	6.5
July	9.5	8.0	7.0	6.0	6.1	5.9	6.1	6.0	6.4	5.9	5.5	5.7	5.8
August.......	6.4	6.5	6.2	6.5	6.8	6.3	6.2	5.9	5.8	6.0	6.0	6.2	6.4
September....	9.4	9.8	10.1	9.2	10.1	9.1	8.9	8.9	8.4	8.2	8.1	8.2	8.1
October	8.4	8.4	9.0	9.1	8.4	7.7	8.3	7.8	7.9	8.8	7.7	7.0	7.6
November ...	14.7	14.1	13.9	13.9	13.5	13.4	13.4	13.8	13.4	13.3	12.9	12.3	12.7
December....	10.2	10.4	9.7	10.0	10.2	10.5	10.7	10.9	11.1	10.8	11.1	10.6	10.2

* The average for the 10 months, March to December, 1879, was 9.7.

The statements in the third figure-column in Table X. of the average velocity of the wind, in miles per hour during the year 1881, are graphically represented in Diagram XVI. page 502; the remaining columns of Table X. for 1881 are graphically represented in Diagram XVII. opposite this page. The high wind at every hour of the day in November, is very noticeable.

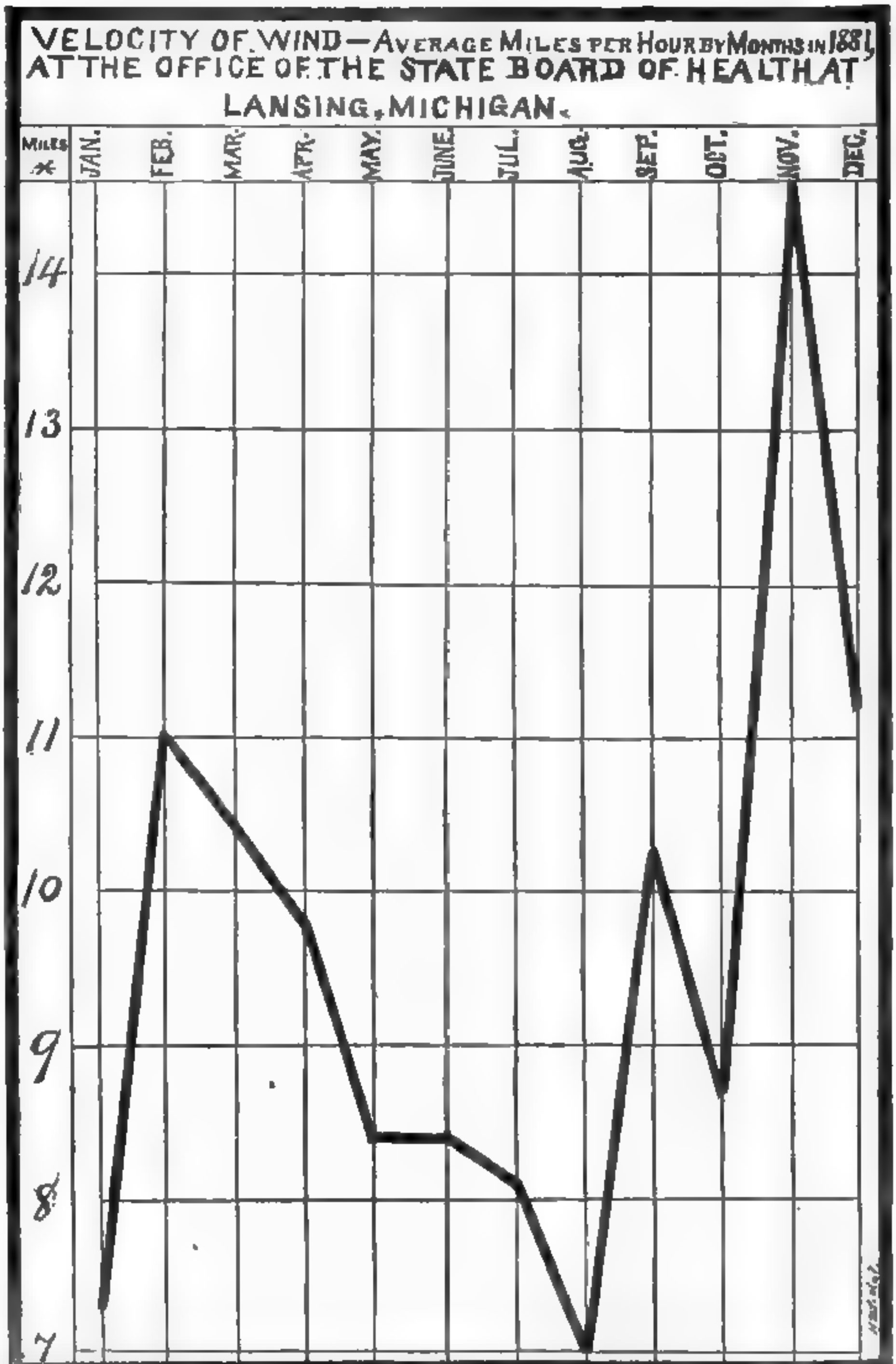
DIAGRAM XVII.—AV. VELOCITY OF WIND EACH HOUR, BY MONTHS, 1881



SCALE, ONE MILE PER HOUR TO .62 OF AN INCH VERTICALLY. DES. by HBB.

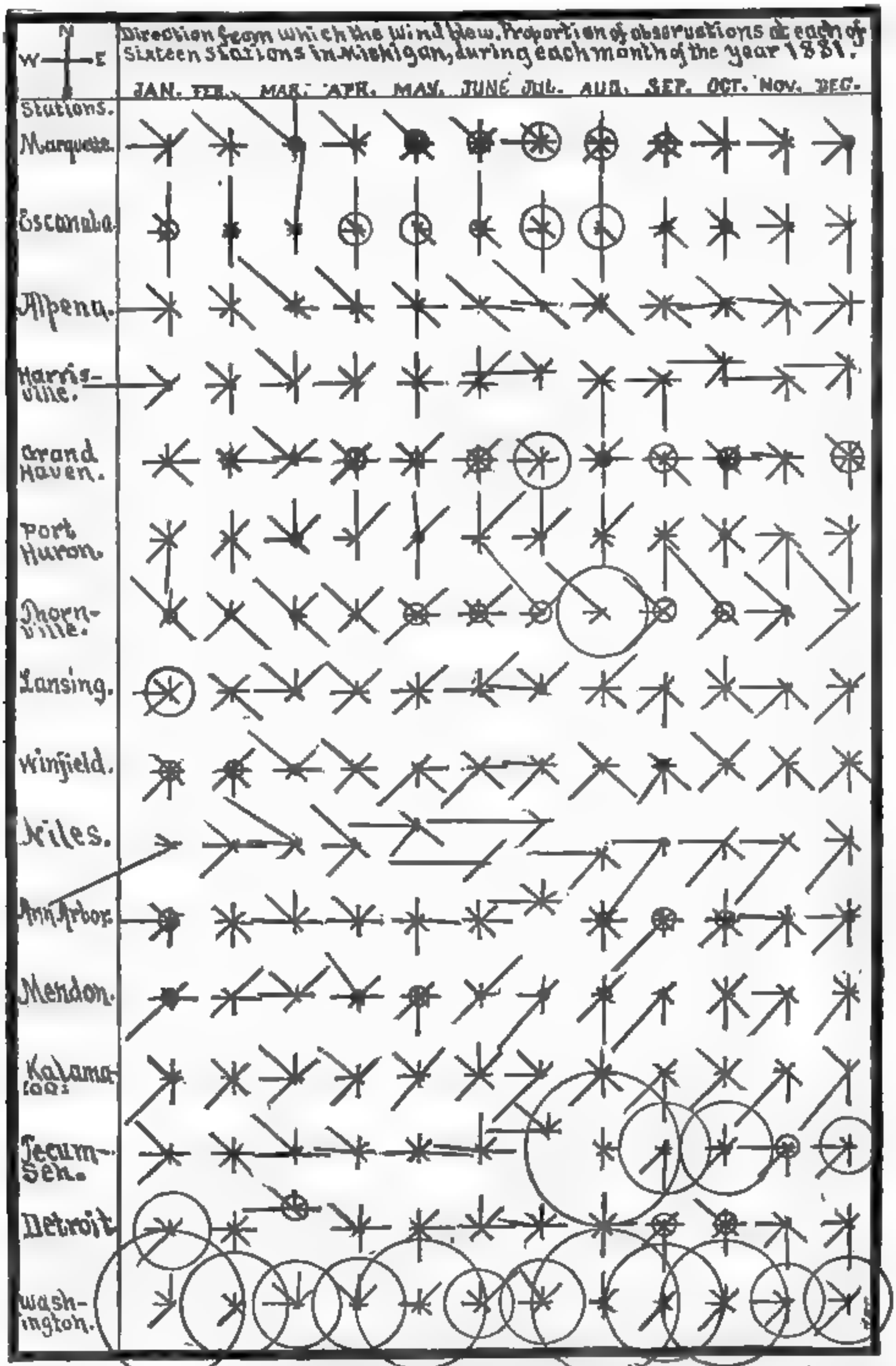
BOSTON PHOTO-ENG. CO.

DIAGRAM XVI.—VELOCITY OF THE WIND, BY MONTHS, IN 1881.



* SCALE, 1 MILE PER HOUR TO .33 OF AN INCH VERTICALLY. Des. by H.B.B.
BOSTON PHOTO ENG CO.

DIAGRAM XX.—WIND, DIRECTION, AT STATIONS, BY MONTHS, IN 1881.



SCALE, line .01 of an inch to one observation. DES. by H.B.B.

BOSTON PHOTO-ENG. CO.

TABLE XI.—*Number of Observations per Month (at 7 A. M., 2 P. M., and 9 P. M., daily) at which the Wind was Blowing from each of the Eight Principal Points of Compass, during the Year and during each Month of the Year 1881,—Average for 19 Stations in Michigan.**

POINTS OF COMPASS.	Average Number of Observations Per Month, 1881.												
	Year.	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All Observat'ns.	91	93	84	93	90	93	90	93	93	90	93	90	93
Calm	5	7	3	4	4	6	4	6	10	7	6	2	4
North	8	8	8	13	9	9	12	8	10	4	8	3	6
North-east	9	8	8	11	11	12	18	9	9	6	7	3	5
East	7	4	8	8	7	11	10	6	6	5	6	3	4
South-east	9	7	11	5	7	10	10	5	12	11	11	10	5
South	11	9	9	4	7	13	6	6	13	17	12	16	16
South-west	16	20	13	6	10	14	10	13	13	23	17	23	25
West	13	15	8	16	12	10	12	22	9	10	11	20	14
North-west	14	14	12	27	21	9	9	18	11	7	15	10	15

Graphic representations of statements in Tables XI. and XII. are given in Diagrams XVIII. and XIX., opposite this page.

TABLE XII.—*Average Number of Observations per Month, for the Year 1881, at which the Wind was Blowing from each of the Eight Principal Points of Compass, at each of 19 Stations in Michigan; also the Average for all said Stations.**

STATIONS IN MICHIGAN.* (Those of the U. S. Signal Service in italics.)	Division of the State.†	Average Number of Observations per Month in 1881.									
		All Obs.	Calms.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Average for 19 Stations	....	91	5	8	9	7	9	11	16	13	14
Marquette	U. P.	91	4	11	6	6	7	12	10	14	22
Escanaba	U. P.	91	5	25	4	4	8	22	7	7	9
Alpena	N. E.	91	1	6	5	8	14	9	9	17	23
Harrisville	N. E.	91	0	9	9	6	4	14	12	25	13
Grand Haven	W.	91	5	6	11	13	9	12	10	12	13
Reed City	W.	91	0	9	5	4	15	15	14	11	19
Port Huron	B. & E.	91	1	16	17	3	7	19	11	9	8
Thornville	B. & E.	91	6	4	11	3	10	2	17	8	30
Agr'l College, near Lansing	C.	91	20	8	9	6	7	6	18	11	7
Lansing, S. B. of Health	C	91	2	7	15	5	11	8	16	16	11
Winfield	C.	91	2	3	10	9	17	9	22	7	14
Niles	S. W.	91	0	2	4	3	7	4	31	29	12
Ann Arbor	S. C.	91	3	9	7	10	8	12	15	16	11
Mendon	S. C.	89	2	5	15	8	6	13	22	10	9
Kalamazoo	S. C.	91	0	7	10	4	7	11	29	3	16
Park	S. C.	91	10	3	9	11	11	8	19	8	14
Tecumseh	S. C.	91	10	9	6	10	5	10	11	18	13
Detroit	S. E.	91	4	10	8	12	7	14	12	14	11
Washington	S E.	91	29	9	11	2	5	5	12	10	10

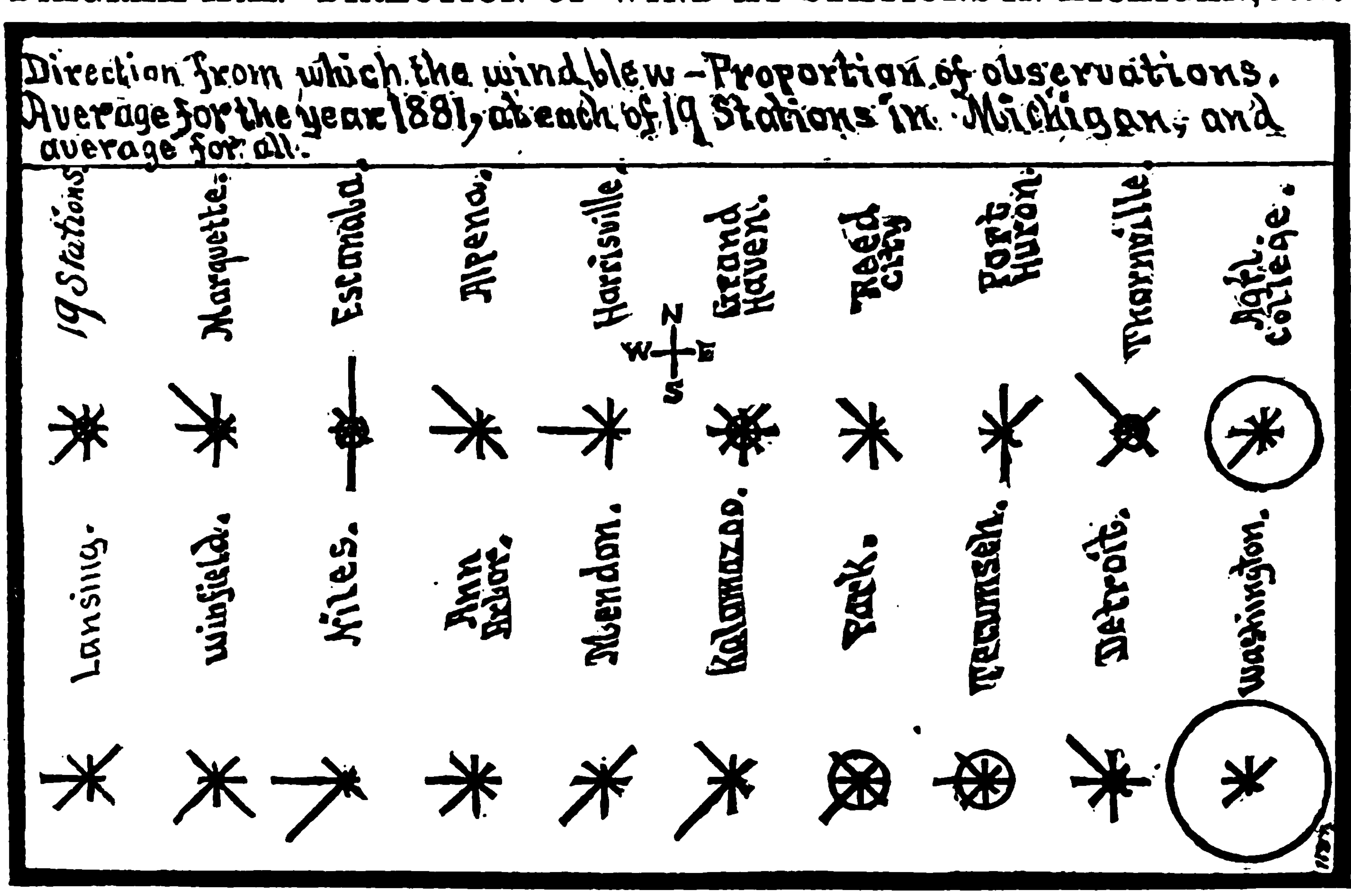
* The names of observers, their places of observation, and the counties, and divisions of the State, in which these places are situated, are stated in Exhibit 7, page 445.

† The full names of the divisions, and the counties in each division, are stated in Exhibit 1, p. 287.

DIAGRAM XVIII.—DIRECTION OF WIND IN MICH., BY MONTHS, IN 1881.

Explanations of the construction and manner of reading Diagrams XVIII., XIX., and XX. are given on page 499. For convenient study, the top of each of these diagrams should be held toward the north. The scale is such that each one-hundredth of an inch of the converging lines represents one observation of wind blowing in the direction indicated by the line, toward the centers of the small figures. The number of calms observed is indicated by the length of the radius of each circle, each one-hundredth of an inch indicating one calm. Exact numerical statements corresponding to these diagrams are given in Tables XI., XII., and XIII.

DIAGRAM XIX.—DIRECTION OF WIND AT STATIONS IN MICHIGAN, 1881.



FOOT-NOTES TO TABLE XIII., PAGES 506-9.

* For names of observers, etc., see Exhibit 7, page 445. For names of divisions, etc., see Exhibit 1, page 287.

† With exceptions stated for the U. S. Signal Service Stations on page 465.

‡ This line includes only the 19 stations from which statements complete or nearly complete were received for every month of the year; it does not include Hastings, Otisville, Adrian, Battle Creek, Hillsdale, Mallory Lake and Hudson, or Marshall.

TABLE XIII.—*Number of Observations for each Month of the Year 1881, at which the Wind was Blowing from each of the Eight Principal Points of Compass, at each of 26 Stations* in Michigan; also the average for the 19 of said Stations from which nearly Complete Observations were received for the Year. (Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily.)†*

STATIONS IN MICHIGAN.* (Those of U. S. Signal Service in Italics.)	Division of the State.*	January. Total.	Calm	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	February. Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	March. Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 19 Stations‡	....	93	7	8	6	4	7	9	20	15	14	84	8	8	8	8	11	9	13	8	12	93	4	13	11	6	5	4	6	16	27
Marquette	U. P.	93	1	5	14	2	2	12	12	23	22	84	0	11	2	9	6	11	6	11	26	93	4	26	1	3	8	5	1	6	44
Escanaba	U. P.	93	5	27	0	2	3	25	7	12	12	84	3	30	4	5	6	20	4	8	9	88	1	49	4	3	8	13	4	4	8
Alpena	N. E.	93	0	8	4	1	9	13	10	27	10	84	1	12	7	3	17	9	7	11	17	93	2	8	7	12	8	4	4	6	41
Harrisville	N. E.	93	0	2	8	1	2	9	17	46	15	84	0	11	6	3	3	15	15	14	18	93	0	17	11	0	1	10	7	10	28
Grand Haven	W.	93	0	9	16	16	17	3	10	16	6	84	4	6	11	25	7	8	6	7	16	93	2	7	15	18	2	1	14	12	27
Reed City	W.	93	0	6	9	1	17	11	15	16	15	84	0	11	5	2	22	11	11	6	16	93	0	8	12	4	5	6	7	12	39
Port Huron	B. & E.	93	0	9	12	0	6	30	16	10	11	84	0	15	13	3	13	17	12	5	0	93	8	20	17	2	9	4	4	16	18
Thornville	B. & E.	93	4	13	14	8	17	4	6	2	30	84	2	7	6	1	26	1	18	2	10	93	3	9	16	5	22	7	1	0	30
Agr'l College, near Lansing§	C.	93	13	9	9	1	8	6	18	20	10	83	15	8	4	7	14	3	20	4	5	93	18	13	10	6	5	0	10	14	17
Hastings	C.	92	18	1	4	14	15	9	8	16	7	67	9	1	0	9	15	5	0	14	4	91	9	2	4	15	6	2	4	32	18
Lansing, S. B. of Health	C.	93	13	9	9	1	8	5	18	20	10	84	0	2	12	6	20	5	15	7	15	93	1	10	21	3	5	2	6	22	23
Otisville	C.	84	8	4	0	0	19	5	24	9	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Winfield	C.	93	6	5	6	7	10	16	21	9	13	84	5	5	13	8	11	15	14	7	4	93	3	8	14	13	6	3	6	11	32
Niles	S. W.	93	0	0	0	2	2	3	73	6	7	84	0	1	3	17	3	9	26	16	18	93	0	3	3	1	1	0	9	26	45
Adrian	S. C.	90	38	4	8	3	5	4	9	23	1	83	25	2	6	13	2	5	13	11	6	92	16	5	7	11	1	4	3	30	15
Ann Arbor	S. C.	92	6	7	6	2	3	18	14	27	15	84	1	8	7	10	13	18	12	7	12	93	1	14	9	14	5	6	2	22	20
Battle Creek	S. C.	93	0	11	9	7	5	20	10	21	10	84	0	3	9	24	3	0	8	25	5	93	0	1	2	30	2	2	3	52	1
Hillsdale	S. C.	93	0	2	9	3	12	18	16	23	13	84	0	5	8	7	26	6	6	9	15	93	0	7	17	4	7	2	1	5	49
Kalamazoo	S. C.	93	0	10	4	5	8	13	34	6	10	84	0	7	12	4	12	9	22	3	15	93	0	10	14	3	1	2	18	19	26
Mallory Lake and Hudson‖	S. C.	93	7	3	7	8	12	3	24	16	13	84	6	5	7	7	26	3	12	13	5	93	2	6	7	6	12	1	18	21	20
Marshall	S. C.	...	...	...	...	...	...	...	...	...	...	79	20	8	8	9	9	5	4	13	6	78	0	3	2	9	2	5	6	32	12
Mendon	S. C.	91	4	3	12	15	8	6	33	9	0	81	1	3	21	15	2	6	14	10	6	92	0	6	25	9	8	2	9	21	17
Park	S. C.	93	27	2	7	5	10	8	20	5	9	84	15	0	6	16	10	4	18	4	11	93	8	6	6	23	1	1	9	17	22
Tecumseh	S. C.	93	6	3	2	11	8	5	23	16	25	84	1	8	5	10	12	10	10	12	16	93	0	11	4	17	2	4	0	35	22
Detroit	S. E.	93	21	5	9	1	3	8	26	15	10	84	1	8	10	18	11	13	11	12	5	93	7	10	6	12	7	1	2	29	19
Washington	S. E.	93	40	15	3	0	8	1	16	7	8	81	20	7	9	1	0	5	14	3	7	93	23	16	10	3	1	2	3	16	17

Diagram XX., page 508, gives 16 lines in this table, and is explained on page 499. *, †, ‡. For these references see footnotes to this table, on page 505.
§ For January the observations were made at the office of State Board of Health, Lansing. ‖ At Mallory Lake till Aug. 1, after that at Hudson.

TABLE XIII.—CONTINUED.—*Direction of Wind, Months in 1881.—Observations at which the Wind was Blowing from Directions Named.*

APRIL.

STATIONS IN MICHIGAN.* (Those of U. S. Signal Service in italics.)	Division of the State.*	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 19 Stations‡	....	90	4	9	11	7	7	7	10	12	21
Marquette	U. P.	90	3	10	11	8	7	8	9	17	26
Escanaba	U. P.	90	9	29	3	5	6	22	2	7	7
Alpena	N. E.	90	2	8	2	9	10	8	5	11	32
Harrisville	N. E.	90	0	16	14	4	3	6	10	22	13
Grand Haven	W.	90	6	4	21	11	3	9	10	11	16
Reed City	W.	87	0	9	4	1	9	9	16	11	28
Port Huron	B. & E.	90	1	26	21	0	2	12	6	11	8
Thornville	B. & E.	90	1	8	22	1	13	3	13	4	25
Agr'l College, near Lansing.	C.	59	20	3	15	5	1	1	17	10	17
Hastings	C.	89	13	3	2	14	8	12	9	20	8
Lansing, S. B. of Health	C.	90	0	4	17	5	6	1	18	14	25
Otisville	C.	......	......	..	....	..	....	..	....	....	....
Winfield	C.	90	2	9	10	10	16	1	17	8	24
Niles	S. W.	90	0	5	2	1	7	2	23	18	32
Adrian	S. C.	88	12	3	6	13	5	5	6	24	14
Ann Arbor	S. C.	90	2	8	12	13	4	9	6	17	19
Battle Creek	S. C.	90	0	0	4	36	2	1	2	36	9
Hillsdale	S. C.	90	0	7	16	4	5	13	1	9	32
Kalamazoo	S. C.	90	0	5	14	2	4	11	20	12	22
Mallory Lake and Hudson‖.	S. C.	90	8	1	9	10	11	0	12	24	15
Marshall	S. C.	73	8	4	4	11	3	5	5	26	0
Mendon	S. C.	90	3	0	15	18	5	7	6	12	24
Park	S. C.	90	9	1	6	15	12	5	7	10	25
Tecumseh	S. C.	90	0	9	7	9	6	9	8	23	24
Detroit	S. E.	90	0	11	7	17	4	12	6	14	19
Washington	S. E.	90	25	16	13	4	1	4	8	5	10

MAY.

STATIONS IN MICHIGAN.	Division of the State.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 19 Stations‡	....	93	[illegible]	9	12	11	10	13	14	10	9
Marquette	U. P.	93	0	7	7	9	13	10	12	4	25
Escanaba	U. P.	93	0	28	4	6	13	26	0	1	4
Alpena	N. E.	93	2	8	5	15	16	17	2	11	17
Harrisville	N. E.	93	0	15	10	14	7	19	3	10	11
Grand Haven	W.	93	4	6	19	8	6	14	11	13	13
Reed City	W.	93	0	5	6	8	17	20	25	9	8
Port Huron	B. & E.	93	3	27	24	3	2	22	9	2	1
Thornville	B. & E.	93	0	1	24	11	8	3	23	4	18
Agr'l College, near Lansing.	C.	93	27	7	6	17	2	8	18	5	3
Hastings	C.	93	25	6	4	4	15	12	9	8	6
Lansing, S. B. of Health	C.	93	2	9	22	7	8	8	18	14	6
Otisville	C.	......	......	..	....	..	....	..	....	....	....
Winfield	C.	93	1	2	9	15	21	9	29	8	4
Niles	S. W.	93	0	3	2	0	16	8	21	38	10
Adrian	S. C.	80	23	2	9	14	5	9	11	3	6
Ann Arbor	S. C.	91	1	12	4	23	7	13	10	13	5
Battle Creek	S. C.	93	0	9	5	36	1	10	2	23	7
Hillsdale	S. C.	93	0	10	23	10	7	10	9	7	17
Kalamazoo	S. C.	93	0	6	20	6	3	7	24	11	10
Mallory Lake and Hudson‖.	S. C.	93	20	5	12	6	5	1	26	3	3
Marshall	S. C.	72	18	2	2	14	8	1	13	15	4
Mendon	S. C.	86	5	4	10	10	7	23	16	8	3
Park	S. C.	93	11	4	11	14	15	6	16	4	12
Tecumseh	S. C.	93	0	9	8	30	7	6	8	16	8
Detroit	S. E.	93	0	10	15	18	9	18	12	5	6
Washington	S. E.	93	36	7	15	4	8	4	7	10	2

JUNE.

STATIONS IN MICHIGAN.	Division of the State.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 19 Stations‡	....	90	4	12	18	10	10	8	10	12	9
Marquette	U. P.	90	7	13	12	7	6	18	7	7	21
Escanaba	U. P.	90	5	30	8	8	16	14	1	4	4
Alpena	N. E.	90	0	5	6	23	20	9	0	9	25
Harrisville	N. E.	90	0	19	24	9	6	6	10	11	8
Grand Haven	W.	90	6	6	16	10	8	11	11	12	8
Reed City	W.	90	0	10	14	5	20	5	16	10	15
Port Huron	B. & E.	90	1	23	35	6	2	0	5	9	0
Thornville	B. & E.	90	5	7	23	14	10	1	8	12	10
Agr'l College, near Lansing.	C.	90	18	16	21	5	6	3	9	7	5
Hastings	C.	80	0	3	15	17	9	8	13	12	3
Lansing, S. B. of Health	C.	90	0	10	20	5	13	8	5	19	8
Otisville	C.	......	......	..	....	..	....	..	....	....	....
Winfield	C.	90	0	2	7	14	17	3	20	6	10
Niles	S. W.	90	0	0	17	4	4	0	13	60	2
Adrian	S. C.	89	23	2	0	10	3	6	11	7	9
Ann Arbor	S. C.	90	1	10	13	17	12	10	8	9	10
Battle Creek	S. C.	90	0	2	4	38	1	18	0	25	7
Hillsdale	S. C.	90	0	12	22	4	7	6	7	8	28
Kalamazoo	S. C.	90	1	16	16	6	9	1	19	7	15
Mallory Lake and Hudson‖.	S. C.	90	20	1	11	15	4	1	9	11	9
Marshall	S. C.	79	3	4	20	19	3	4	13	9	5
Mendon	S. C.	88	1	5	32	9	3	5	20	3	10
Park	S. C.	90	9	6	21	9	9	9	16	4	7
Tecumseh	S. C.	90	1	10	10	17	5	7	1	28	4
Detroit	S. E.	90	0	10	15	19	9	4	7	10	10
Washington	S. E.	90	19	10	27	2	6	2	6	10	8

*, †, ‡. For these references see footnotes to this table on page 505. ‖ At Mallory Lake till August 1, after that at Hudson.

NOTE.—Graphic representations of statements for 18 lines in this table are given in Diagram XX., page 503, which is explained on page 499.

TABLE XIII.—CONTINUED.—*Direction of Wind, Months in 1881.—Observations at which the Wind [illegible] Blowing from Directions Named.*

STATIONS IN MICHIGAN.* (Those of U. S. Signal Service in italics.)	Division of the State.*	July. Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	August. Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	September. Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Av. for 19 Stations‡	....	93	6	5	9	6	5	6	13	22	18	93	10	10	9	6	12	13	13	9	11	90	7	4	6	5	11	17	23	[illegible]	7
Marquette	U. P.	93	10	10	5	8	9	5	8	23	15	93	9	16	4	8	7	16	14	9	10	90	6	10	4	9	12	13	17	11	9
Escanaba	U. P.	93	12	20	5	1	9	25	4	9	8	93	12	29	0	1	11	30	6	3	2	90	2	16	8	6	16	23	6	8	3
Alpena	N. E.	93	1	3	2	7	10	4	2	18	37	93	2	6	6	3	23	4	12	16	21	90	1	4	6	15	19	7	15	13	11
Harrisville	N. E.	93	0	3	8	8	0	10	5	43	16	93	0	3	8	4	6	31	18	13	16	90	0	2	6	3	5	27	13	21	8
Grand Haven	W.	93	15	6	6	8	1	11	11	18	17	93	4	6	14	16	4	16	9	11	10	90	6	3	6	14	20	17	4	10	8
Reed City	W.	93	0	9	1	12	3	6	12	16	34	93	0	16	7	3	27	6	6	5	23	90	0	5	2	3	11	28	17	20	4
Port Huron	B. & E.	93	2	27	21	1	1	9	10	15	7	93	1	32	23	5	7	15	6	4	5	90	2	7	13	5	11	30	12	5	5
Thornville	B. & E.	93	6	2	12	0	1	0	11	11	50	93	25	1	5	0	5	0	9	10	40	90	6	2	5	0	5	0	31	13	28
Agr'l College, near Lansing	C.	93	27	13	11	3	3	1	14	13	6	93	26	10	16	3	11	6	14	8	2	88	24	2	2	4	9	11	30	5	2
Hastings	C.	92	30	1	9	10	3	5	5	25	4	......	......	..	....	..	....	..	....	....	....	88	13	3	1	7	13	29	13	3	2
Lansing, S. B. of Health	C.	93	3	5	20	2	4	2	9	30	17	93	0	8	25	10	16	10	11	11	2	90	0	8	6	2	13	24	21	13	3
Otisville	C.	93	0	4	12	24	2	3	6	32	10	93	0	7	11	23	13	4	13	10	7	90	0	2	3	16	18	10	27	15	4
Winfield	C.	93	2	3	9	6	12	4	28	21	8	93	0	1	5	9	24	3	27	6	15	90	3	1	4	7	16	15	26	6	10
Niles	S. W.	93	0	0	2	5	1	0	16	62	7	93	0	0	5	0	11	8	28	40	2	90	0	0	0	0	3	8	50	27	2
Adrian	S. C.	91	28	2	8	4	3	4	8	24	10	......	......	..	....	..	....	..	....	....	....	......	......	..	....	..	....	..	....	....	....
Ann Arbor	S. C.	93	2	10	9	10	8	3	10	26	13	93	4	9	9	12	12	16	11	11	9	90	6	5	4	9	7	9	38	6	6
Battle Creek	S. C.	93	0	7	1	22	2	9	2	46	4	......	......	..	....	..	....	..	....	....	....	90	0	0	4	4	16	17	39	6	2
Hillsdale	S. C.	93	0	13	7	4	6	2	0	19	42	93	0	19	17	6	10	5	12	7	17	......	......	..	....	..	....	..	....	....	....
Kalamazoo	S. C.	93	1	5	9	2	3	1	37	18	17	93	2	12	6	7	18	13	25	5	10	90	0	1	8	5	9	26	32	3	6
Mallory Lake and Hudson.‖	S. C.	92	32	1	13	1	3	0	17	12	13	62	28	1	10	2	5	2	7	5	2	90	17	1	4	3	0	1	36	17	11
Marshall	S. C.	85	19	8	9	5	5	3	10	15	16	87	27	4	9	12	10	4	12	5	4	78	13	2	6	4	10	11	29	2	8
Mendon	S. C.	93	8	8	12	4	2	10	37	13	4	90	3	8	14	2	5	27	20	4	4	88	2	2	8	3	7	17	41	5	3
Park	S. C.	93	9	2	6	15	4	5	13	11	29	93	10	3	15	13	13	14	9	8	16	90	7	1	9	1	21	10	31	2	8
Tecumseh	S. C.	93	1	11	9	7	1	4	5	34	23	93	42	10	4	7	7	9	6	2	7	90	25	4	3	4	5	24	18	5	9
Detroit	S. E.	93	1	13	10	14	1	7	12	24	11	93	2	17	7	18	7	17	9	6	16	90	6	3	8	6	7	27	17	10	6
Washington	S. E.	93	23	7	14	4	4	0	7	13	21	93	40	18	8	1	8	8	4	8	1	90	32	5	9	0	7	8	21	6	3

*, ‡. For these references see foot-notes to this table, on page 505. ‖ At Mallory Lake till August 1, after that at Hudson.

NOTE.—Graphic representations of statements for 16 lines in this table are given in Diagram XX., page 503, which is explained on page 499.

TABLE XIII.—CONCLUDED.—*Direction of Wind, Months in 1881.—Observations at which the Wind was Blowing from Directions Named.*

STATIONS IN MICHIGAN.* (Those of U. S. Signal Service in italics.)	Division of the State.*	OCTOBER. Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	NOVEMBER. Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	DECEMBER. Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Av. for 19 Stations‡	....	93	6	8	7	6	11	12	17	11	15	90	2	3	3	3	10	16	23	20	10	93	4	6	5	4	5	16	25	14	15
Marquette	U. P.	93	0	14	0	7	6	17	12	18	19	90	0	6	4	2	5	10	12	22	20	93	3	4	2	2	2	19	20	20	21
Escanaba	U. P.	93	4	18	2	4	8	10	14	9	16	90	0	12	5	4	6	20	14	16	15	93	1	14	4	1	2	26	16	13	16
Alpena	N. E.	93	2	3	5	5	13	7	9	26	23	90	0	1	8	1	9	16	19	27	14	93	1	5	1	7	1	13	26	25	14
Harrisville	N. E.	93	0	5	4	10	0	13	10	31	14	90	0	8	2	4	12	12	10	37	10	93	0	5	3	2	4	17	19	35	8
Grand Haven	W.	93	0	5	8	19	11	17	3	11	14	90	1	3	8	10	13	14	16	19	11	93	9	6	9	6	11	18	9	9	16
Reed City	W.	93	0	10	1	5	18	29	12	6	12	90	0	6	3	2	15	23	12	9	20	93	0	7	1	4	13	29	14	8	17
Port Huron	B. & E.	93	2	9	15	4	13	19	12	3	16	90	0	1	3	3	10	29	20	17	7	93	0	6	6	1	3	32	16	13	14
Thornville	B. & E.	93	5	0	0	2	10	0	22	7	47	90	2	0	1	0	6	7	23	22	29	93	1	2	5	2	1	0	33	6	43
Agr'l College, near Lansing.	C	93	29	10	3	8	9	7	17	7	3	90	4	2	2	4	7	10	23	28	4	93	15	4	9	8	8	12	26	15	6
Hastings	C.	91	20	6	5	7	11	16	13	7	6	89	1	2	7	3	15	19	15	18	6	91	11	2	9	9	7	11	17	16	9
Lansing, S. B. of Health.	C.	93	1	16	6	2	20	7	18	9	14	90	0	1	2	3	16	12	24	26	0	93	0	4	10	5	3	14	30	12	15
Otisville	C.	93	0	9	8	12	7	9	15	16	17	90	0	8	1	6	18	6	26	13	12	93	0	2	7	6	6	6	38	12	14
Winfield	C.	93	2	3	18	6	15	4	19	4	24	90	0	2	10	6	21	11	25	3	12	93	1	6	8	7	15	18	22	5	12
Niles	S. W.	93	0	0	10	1	14	9	32	25	2	90	0	3	4	0	8	2	44	25	4	93	0	4	2	1	6	13	36	15	16
Adrian	S. C.	......	......	..	....	..	....	..	....	....	..	......	......	..	....	..	....	..	....	....	....	......	......	..	....	..	....	..	....	....	....
Ann Arbor	S. C.	93	5	10	6	7	11	12	19	9	7	90	0	4	2	2	12	17	23	26	4	93	3	8	7	5	1	13	26	22	8
Battle Creek	S. C.	92	2	2	13	12	13	15	10	19	3	89	0	0	1	7	9	9	22	25	6	93	0	8	7	9	0	12	25	21	11
Hillsdale	S. C.	......	......	..	....	..	....	..	....	....	....	90	0	4	5	0	11	24	11	21	14	93	0	10	7	0	3	17	14	13	29
Kalamazoo	S. C	93	0	8	10	3	13	8	28	4	19	90	0	0	5	1	11	16	42	6	9	93	0	6	7	0	1	19	41	1	18
Mallory Lake and Hudson.‖	S. C.	93	20	17	7	1	2	7	24	2	12	90	5	8	2	2	2	8	52	7	9	93	21	7	6	5	1	2	30	6	15
Marshall	S. C.	92	25	8	9	5	12	6	16	6	6	90	8	0	2	7	7	10	36	15	5	93	16	2	7	6	7	2	36	10	7
Mendon	S. C.	89	0	8	17	4	17	18	14	2	9	86	9	1	5	2	6	19	30	10	6	89	0	8	5	4	0	14	29	9	11
Park	S. C.	93	2	4	14	7	11	7	24	5	19	90	1	1	5	8	10	17	31	17	7	93	7	5	1	8	10	11	35	5	11
Tecumseh	S. C.	93	25	12	9	4	4	10	14	10	5	89	7	1	3	4	4	15	23	26	4	93	15	6	2	5	2	13	24	20	6
Detroit	S. E.	93	6	8	5	11	9	16	11	7	20	90	2	4	2	4	12	25	17	17	7	92	2	9	6	3	4	23	19	14	10
Washington	S. E.	93	34	9	8	0	6	2	18	7	9	90	20	1	3	2	3	12	21	20	8	93	23	3	7	2	0	7	25	11	15

*, ‡. For these references see foot-notes to this table, on page 505. ‖ At Mallory Lake till Aug. 1, after that at Hudson.

NOTE.—Graphic representations of statements for 16 lines in this table are given in Diagram XX., page 503, which is explained on page 499.

TABLE XIV.—*Average Atmospheric Pressure, for the Year, and for each Month in the Year 1881, at 15 Stations in Michigan, as indicated by the Height, in inches, of Mercury in the Barometer. Corrected for Temperature,—Reduced to 32° F., (for some Stations not corrected for Instrumental Errors*)—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,† by Observers‡ for the State Board of Health and for the U S Signal Service.*

STATIONS IN MICHIGAN.‡ (Those of U. S Signal Service in italics.)	Division of the State.‡	Inches of Mercury.—Atmospheric Pressure. Years. 1878.	1879.	1880.	1881.	Months, 1881. Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
Av. for 12 Stations§	....	a.	b.	c.	29.151	29.209	29.222	28.979	29.120	29.175	29.082	29.146	29.180	29.122	29.220	29.164	29.187
Marquette.........*	U. P.	......	29.267	29.245	29.282	29.346	29.390	29.222	29.282	29.375	29.228	29.256	29.288	29.185	29.327	29.215	29.260
Alpena............*	N. E.	......	29.340	29.336	29.352	29.424	29.455	29.201	29.328	29.388	29.300	29.325	29.384	29.319	29.425	29.316	29.359
Grand Haven.....*	W.	......	29.350	29.346	29.348	29.426	29.419	29.195	29.341	29.359	29.269	29.346	29.366	29.292	29.410	29.359	29.393
Reed City...........	W.	......	29.054	28.924	28.865	28.886	28.930	28.704	28.842	28.881	28.804	28.874	28.914	28.837	28.953	28.858	28.895
Port Huron.......*	B. & E.	......	29.341	29.332	29.310	29.413	29.421	29.132	29.301	29.363	29.265	29.310	29.359	29.318	29.409	29.400	29.386
Thornville.........	B. & E.	......	......	28.930	28.935	28.975	28.959	28.719	28.880	[d]28.978	28.889	28.941	28.982	28.939	29.017	28.961	28.976
Agr'l College, near Lansing.........	C.	29.053	29.083	29.105	29.087	29.077	29.152	28.899	29.064	29.116	29.018	29.093	29.117	29.077	29.181	29.120	29.134
Ionia	C.	......	......	......	(29.251)‖	29.318	29.309	29.088	29.204	29.241	......	29.238	29.278	29.202	29.301	29.279	29.307
Lansing, State B'd of Health.........	C.	......	29.045	29.016	29.017	29.077	29.071	28.821	28.978	29.038	28.940	29.035	29.063	28.999	29.089	29.037	29.056
Ann Arbor..........	S. C.	......	......	......	29.039	29.094	29.104	28.842	28.995	29.059	28.959	[e]29.053	29.071	29.028	29.113	29.076	29.079
Battle Creek	S. C.	28.651	28.655	28.611	(28.556)‖	28.705	28.672	28.424	28.547	28.601	28.500	28.553	......	28.528	28.566	28.498	28.523
Kalamazoo..........	S. C.	29.037	29.099	29.008	29.112	29.173	29.169	28.950	29.084	29.180	29.036	29.116	29.143	29.088	29.172	29.131	29.157
Mendon.............	S. C.	......	......	......	29.103	[d]29.200	[g]29.167	28.937	29.070	[g]29.070	[f]29.057	[e]29.090	[d]29.120	[e]29.063	[f]29.148	[e]29.132	[f]29.176
Tecumseh	S. C.	......	29.041	28.980	(29.019)‖	29.048	29.053	28.779	28.935	28.972	28.878	28.946	......	......	29.210	[e]29.199	29.175
Detroit...........*	S. E.	29.268	29.348	29.350	29.325	29.415	29.412	29.120	29.278	29.338	29.221	29.315	29.355	29.315	29.398	29.365	29.373

* For stations marked thus * a correction has been made for instrumental error, as follows: For Marquette .004 added; for Alpena .006 added; for Grand Haven .002 added; for Port Huron .001 subtracted; for Detroit .017 added. For other stations the instrumental error of barometer is not known. The observations compiled in this Table were made with Green's Standard Barometers.

† At stations of the U. S. Signal Service for the last six months of the year, the observations were made 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of these stations is stated in the (*) foot-note to Table IV., page 465.

‡ The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 7, page 445. The full names of the divisions and the counties in each division are stated in Exhibit 1, page 287.

‖ An average not for the year but for the months in 1881 represented in this line.

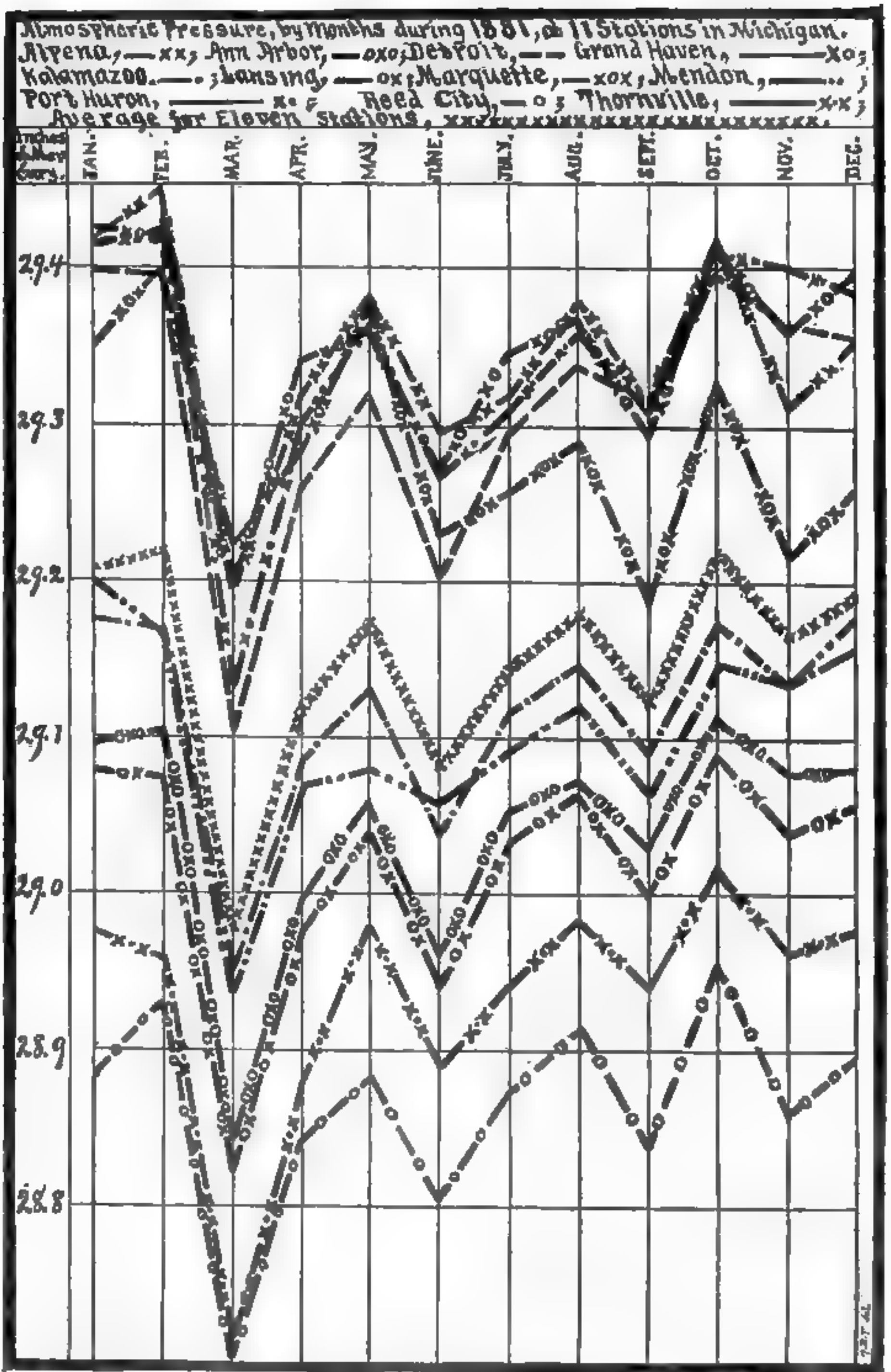
§ This line is an average for only the localities for which reports were received for every month of the year.

a The average for 8 stations in 1878 is 29.108. b The average for 13 stations in 1879 is 29.155. c The average for 14 stations in 1880 is 29.138.

d For 30 days. e For 29 days. f For 28 days. g For 25 days.

The lines for 12 stations in this Table are graphically represented in Diagram XXI, page 511.

DIAGRAM XXI.—ATMOSPHERIC PRESSURE, BY MONTHS, IN 1881.



SCALE, .1 INCH OF MERCURY TO .85 OF AN INCH VERTICALLY. DES. by H.B.B.

BOSTON PHOTO-ENG. CO.

EXHIBIT 32.—*Comparison of the Average Atmospheric Pressure during the Year and during each Month of the Year 1881, with Averages for the 6 Years 1875-80, and for the Year 1880,—Corrected for Temperature and for Instrumental Error. Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, Etc.	Average Atmospheric Pressure.—Inches of Mercury.												
	Ann. Av.	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 6 Yrs., '75-80.	29.035	29.058	29.026	28.986	28.975	29.041	29.006	29.040	29.045	29.084	29.049	29.055	29.055
1880	29.016	28.998	28.973	29.042	28.916	29.002	28.983	28.996	29.052	29.058	29.043	29.113	29.011
1881	29.087	29.077	29.152	28.899	29.064	29.116	29.018	29.093	29.117	29.077	29.181	29.120	29.134
In 1881 Greater than Av. 1875-80.	.052	.019	.126	------	.089	.075	.012	.053	.072	------	.132	.065	.079
In 1881 Less than Av. 1875-80	------	------	------	.087	------	------	------	------	------	.007	------	------	------
In 1881 Greater than in 1880	.071	.079	.179	------	.148	.114	.035	.097	.065	.019	.138	.007	.123
In 1881 Less than in 1880	------	------	------	.143	------	------	------	------	------	------	------	------	------

EXHIBIT 33.—*Average Atmospheric Pressure, by Year and Months, in 1881, compared with Annual and Monthly Averages for the 5 Years, 1877–81.**

Years, Etc	Average Atmospheric Pressure.—Inches of Mercury.												
	Ann. Av.	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 yrs., 1877–81	29.140	29.192	29.186	29.122	29.078	29.133	29.074	29.098	29.110	29.160	29.173	29.176	29.169
1877 (7 stations*).	29.145	29.211	29.267	29.152	29.114	29.143	29.042	29.064	29.063	29.144	29.135	29.164	29.242
1878 (7 stations*).	29.116	29.241	29.166	29.137	28.987	29.081	29.043	29.084	29.041	29.194	29.139	29.168	29.104
1879 (13 stations*)	29.155	29.169	29.173	29.163	29.122	29.176	29.121	29.091	29.106	29.188	29.221	29.152	29.176
1880 (14 stations*)	29.133	29.134	29.105	29.191	29.048	29.092	29.085	29.106	29.163	29.153	29.150	29.231	29.139
1881 (12 stations*)	29.149	29.207	29.220	28.977	29.118	29.173	29.080	29.144	29.178	29.121	29.220	29.164	29.186
In 1881 Greater than Av., 1877–81	.009	.015	.034	------	.040	.040	.006	.046	.068	------	.047	------	.017
In 1881 Less than Av. 1877–81	------	------	------	.145	------	-----	------	------	------	.039	------	.012	------

* Kalamazoo for the 5 years 1877-81; also Battle Creek for 4 years 1877-80; Detroit for 4 years 1878–81; Woodmere Cemetery (near Detroit) for 3 years 1877-9; Mendon for 1877, 1878, 1881; Marquette, Alpena, Grand Haven, Port Huron, and Lansing for 3 years 1879-81; Benton Harbor for 1877, 1878; Ypsilanti for 1877, 1879; Agricultural College for 1877, 1881; Otisville for 1878–80; Tecumseh, Washington, and Nirvana and Reed City for 1879, 1880; Thornville for 1880, 1881; Escanaba for 1880; and Ann Arbor for 1881.

The foregoing report relative to meteorological conditions in Michigan in 1881, is respectfully submitted.

HENRY B. BAKER.

WEEKLY REPORTS OF DISEASES IN MICHIGAN DURING THE YEAR 1881.

A Report Based on a Compilation of Weekly Reports from Health Officers of Cities and from Regular Correspondents of the State Board of Health.—Prepared in the Office of the Secretary of the Board.

This paper presents a summary for the year 1881 (or for the 52 weeks ending Saturday, Dec. 31, 1881) of the weekly reports of diseases received by the State Board from health officers of cities and villages, and from regular correspondents of the Board.* Reports from health officers of cities and from correspondents have been received since the 1st of September, 1876. In November, 1881, reports were asked from the health officers of such villages as had complied with the law requiring the village board of health to appoint a physician as the health officer and to report to this office the facts concerning his appointment. Many of the village health officers complied with the request to make weekly reports.

At first the names of but 19 diseases were printed on the blanks for reports. Reports are now regularly received concerning 26 diseases, the following-named diseases having been at different times added to the blanks: Pulmonary consumption, remittent fever, typho-malarial fever, neuralgia, tonsilitis, inflammation of brain, and inflammation of bowels. Observers are also asked to add reports concerning any important disease which may occur, the name of which is not printed on the blank.

PLAN OF THE REPORTS.

The method of securing and the plan of marking these reports may be thus stated:—

The blanks for the weekly reports are printed on postal cards, which are supplied to the observers of diseases. Blank record-books, in which to preserve copies of the reports, remarks, etc., are also supplied to these observers, to be retained by them. The reports are forwarded weekly to the Secretary of the State Board of Health, at Lansing.

The plan of making the report is as follows: Each observer to mark the disease of which there was the greatest number of cases during the week for which the report is made, 1; that of which there was the next greatest number of cases, 2; the next 3, and so on, applying *consecutive* numbers to the diseases reported present; but marking with the *same* figure all diseases of which there is the same number of cases; to write 0 opposite each disease mentioned of which there was no case; to apply these numbers without regard to severity of the cases; to include all cases, without regard to when they were taken sick, so long as they are actually sick with the given disease; to include all cases within the knowledge or reasonable belief of the observer, without regard to who may have charge of them; to indicate the severity of the diseases reported, by the signs =, +, and —, denoting respectively that a disease was usually severe, more than usually, or less than usually

*This paper continues a subject begun in the Report of the State Board of Health for the year 1876, and continued in each subsequent Report.

severe. It has not seemed best to ask for an exact statement of the number of cases, though a blank is left for that purpose, on the margin of the card, for the convenience of those observers who prefer to state the number of cases rather than the order of prevalence by the foregoing method.

To illustrate the method of making the reports the following copy of one of the blanks now in use is given, correctly marked, in the "prevalence" column, for the number of cases stated on the right-hand margin. It should be remembered that the numbers in the "prevalence" column denote simply the relative order in which the several diseases appear to be prevalent, and do not denote a definite number of cases; so that a disease might one week be marked *4* and the following week, with the same number of cases, be marked *1*. Names of diseases and figures printed in italics are not *printed* on the postal blanks but are supposed to have been *written* on the report by the observer.

Diseases in ....,
[Please Date.]
week ending Sat., ..., ***188*** ....

No.		Prevalence. Order. See a.	Severity. See b	*Cases.*
Ed. 17	Brain, Inflammation of.....	*14*	+	*1*
	Bowels, Inflammation of....	*12*	—	*3*
	Bronchitis................	*11*	=	*4*
	Cerebro-spinal Meningitis.	*0*	....	*0*
	Cholera Infantum	*8*	—	*9*
	Cholera Morbus..............	*10*	+	*6*
	Consumption, Pulmonary..	*10*	—	*6*
	Croup, Membranous..	*12*	+	*3*
	Diphtheria	*5*	[illegible]	*14*
	Diarrhea.....	*3*	[illegible]	*17*
	Dysentery	*8*	+	*9*
	Erysipelas......................	*13*	=	*2*
	Fever, Intermittent.........	*2*	+	*31*
	Fever, Remittent............	*11*	—	*4*
	Fever, Typhoid (Enteric)..	*0*	....	*0*
	Fever, Typho-malarial......	*9*	+	*7*
	Influenza	7	—	*11*
	Measles	*1*	=	*37*
	Neuralgia	*14*	+	*1*
	Pneumonia.............	9	=	*7*
	Puerperal Fever...	*0*	....	*0*
	Rheumatism	*6*	+	*12*
	Scarlatina..	*4*	+	*16*
	Small-pox......................	*0*	....	*0*
	Tonsillitis	*11*	—	*4*
	Whooping-cough	*0*	....	*0*
	Mumps	*6*	+	*12*
	Dyspepsia.....................	*11*	+	*4*
	....	....	....	......

a. Please mark the disease of which there's the greatest number of cases, 1; the disease having next greatest number of cases, 2; the next, 3, and so on for each disease, writing the same figures opposite diseases having the same number of cases. Write 0 opposite diseases not present. [For entire plan, see "Printed Letter Stating Plan," pages 340-347, Fifth Annual Report of S. B. of H.] A blank indicates that the item has been overlooked.
b. The sign = indicates the usual severity, + indicates more, — indicates less than the usual severity. Please mail this, signed and dated, as soon as convenient after close of week specified.

...., ***M. D.***

COMPILATION OF THE REPORTS.

The method of compiling the reports is set forth in connection with tables on the following pages; it is somewhat more fully explained on pages 306, 307, and 310 of the Report for 1881. Table 3, giving statements of diseases for each locality from which reports were received for 1881 has been prepared, but for want of room it is not printed in this Report. The manuscript is preserved for reference and future study.

For several diseases a comparison has been attempted of the amount of sickness in 1881 (as indicated by the proportion of reports stating presence of

the disease) with the average amount for a period of five years. These comparisons are stated in Exhibit 40, and following Exhibits.

The method of studying the sickness-reports in connection with statements of coincident meteorological conditions, heretofore applied to about twelve of the leading diseases, has in this Report, in addition to those before treated, been applied to scarlet fever, whooping-cough, remittent fever, and typhoid fever. This study is made in Exhibit 39, and other exhibits following that.

WEEKLY BULLETINS OF SICKNESS IN MICHIGAN.

At its meeting in October, 1881, the State Board of Health directed the secretary to supply, to such newspapers of the State as would publish it, a weekly bulletin relative to sickness in Michigan. Such bulletins have been regularly issued and have been in whole or in part published in a large proportion of the papers published in this State. The bulletins are based principally on information received by means of the weekly reports.

LEADING DISEASES FOR A PERIOD OF YEARS.

By the first figure column in Exhibit 34, page 517, it may be seen that, on an average for the five years 1877–81, intermittent fever was reported present on 81 per cent of the weekly card-reports received; rheumatism, on 68 per cent of the reports; bronchitis, on 62 per cent; pulmonary consumption, on 66 per cent; remittent fever, on 55 per cent; diarrhea, on 46 per cent; pneumonia, on 41 per cent; diphtheria, on 26 per cent; other diseases on still less reports, and small-pox on but one per cent of the reports received.

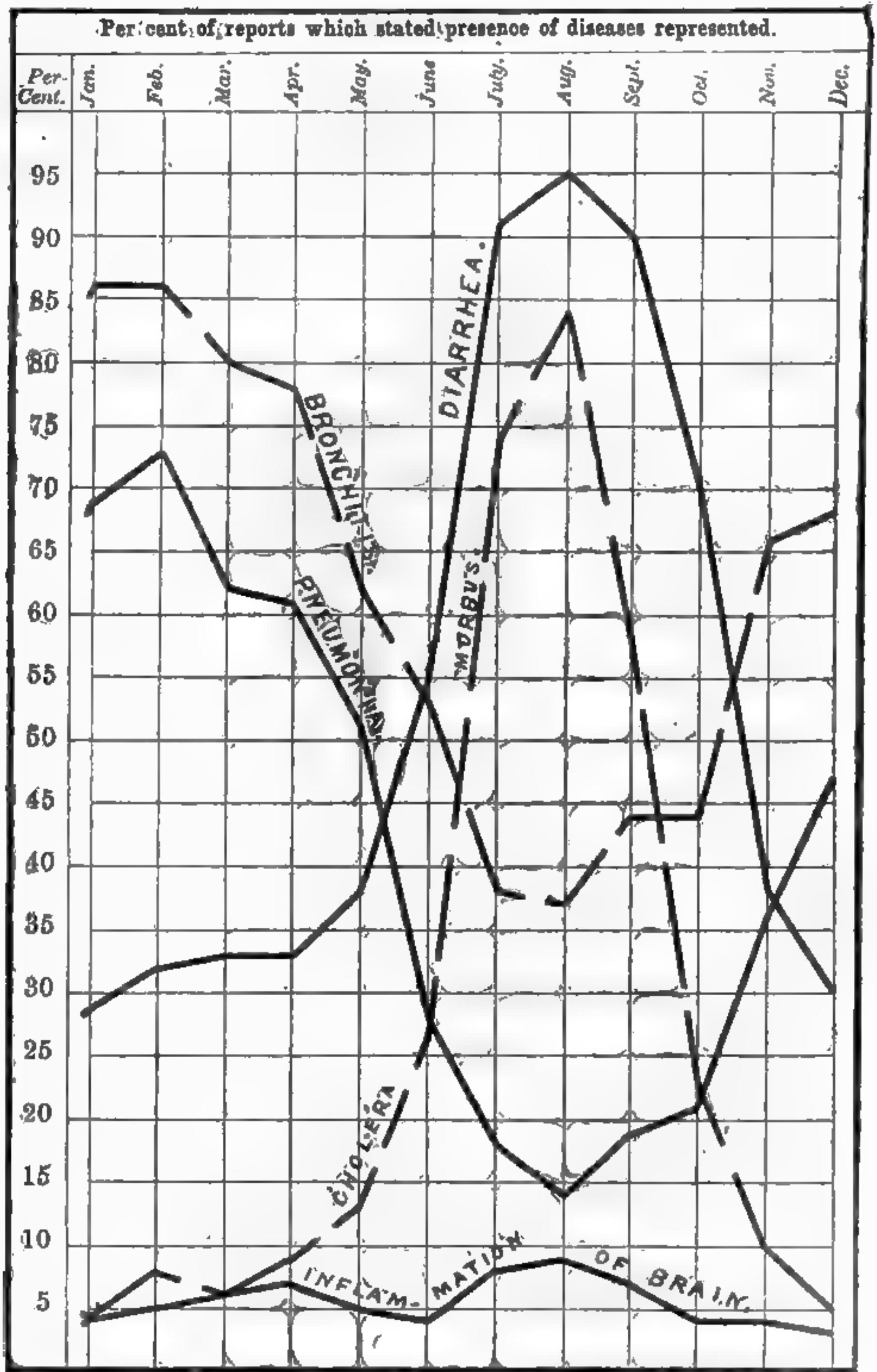
DIPHTHERIA.

That diphtheria should be reported on so large a proportion of the weekly reports indicates an amount of sickness from that disease which should receive the most careful attention. It is a disease which may affect persons at any age, but is most fatal to children under ten years of age. Diphtheria is communicated from person to person by the ordinary intercourse of social life and of the sick-room; it may even be carried from house to house in clothing worn by those who do not themselves have the disease; it is believed that it has been carried in clothing in trunks and communicated months after the clothing became infected; that it has been communicated by clothing or bedding that had been laid away for months; that the house itself in which there has been a case of diphtheria may, months, and perhaps years, afterwards, be a source of infection to a new family moving into it, to a child born in the house, or to visiting children. With a disease so easily communicated, and with the many means of rapid communication between families and towns, there is no reason why this disease does not extend all over the State and become a resident plague in nearly every community, except the vigilance of the local health authorities and of visiting physicians, aided by the efforts of conscientious householders in carrying out measures for the suppression of this disease wherever it appears.

The State Board of Health has published and widely distributed throughout the State to local boards of health, to physicians, and others, explicit directions for the prevention and restriction of diphtheria. In many places local boards of health, following these directions, have been successful in suppressing the disease. But so long as it is allowed to exist in one place it is liable at any time to spread to other places. So long as a house, a garment, or a bed once infected is left not properly disinfected, the disease may break out at any time

[Continued on page 518.

DIAGRAM 1.—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1881.



Designed by Henry B. Baker.

EXHIBIT 34.—*Stating for Each of 26 Diseases, for the Five Years ending December 31, 1881, for each of those years, and by Months of the Year 1881, on what Per Cent of the Reports Received the Disease was stated to be Present.—Compiled from Weekly Reports by Health Officers of Cities and Villages, and by Regular Correspondents of the State Board of Health.**

DISEASES.	What Per Cent of Reports Received Stated Presence of Diseases Named.																	
	Av., '77-81.	Year.					Months, 1881.											
		1877	1878	1879	1880	1881	Jan	Feb	Mar	Apr	May	Jun	J'ly	Aug	Sep	Oct	Nov	Dec
Average*	31	28	30	33	32	33	34	31	32	35	31	30	34	37	38	35	32	31
Brain, Inflam. of	....	....	....	...	6	5	4	5	6	7	5	4	8	9	7	4	4	3
Bowels, Infl. of	....	....	....	....	12	14	11	18	15	8	7	14	20	21	18	12	12	14
Bronchitis	62	55	64	64	64	62	86	86	80	76	62	53	33	37	44	44	66	68
Cerebro-S. M.	4	3	2	2	2	9	4	3	5	15	20	11	8	7	7	[illegible]	7	7
Cholera Inf	14	11	11	14	14	18	0	1	1	0	3	[illegible]	51	60	51	18	4	1
Chol. Morb.	19	15	14	19	20	26	4	8	6	9	13	26	74	84	58	23	[illegible]	5
Cons'mpt. P.	66	52	71	70	68	71	74	76	73	76	69	68	67	67	70	73	[illegible]	67
Croup, Mem.	7	5	7	7	6	9	16	19	13	9	5	5	4	4	5	6	11	11
Diptheria	26	10	23	29	27	34	36	30	29	32	33	26	25	29	33	44	42	40
Diarrhea	46	41	41	48	47	52	20	22	33	33	38	55	[illegible]	95	90	70	38	30
Dysentery	20	21	19	19	18	23	5	4	5	3	5	16	56	60	62	31	9	3
Erysipelas	23	20	21	25	25	23	30	28	29	25	22	23	17	16	15	18	21	24
Fever, Inter.	81	75	82	82	82	82	67	69	70	84	88	[illegible]	92	94	93	91	88	69
Fever, Remit	55	52	58	57	56	54	49	45	41	52	57	55	58	63	66	69	56	47
Fever, Typhoid	14	14	10	12	14	18	13	10	7	5	6	6	12	23	35	37	32	25
F., Typho-mal.	25	26	24	22	24	29	17	17	15	9	18	9	18	30	57	70	61	40
Influenza	41	41	44	45	42	35	57	64	59	52	30	10	9	16	17	16	34	[illegible]
Measles	14	7	5	12	19	26	19	30	39	61	62	44	26	16	8	5	3	3
Neuralgia	....	....	....	59	64	65	60	75	72	72	64	63	56	54	57	58	67	67
Pneumonia	41	40	41	41	42	41	69	73	62	61	51	28	18	14	19	21	36	47
Puerperal Fev.	4	4	3	3	3	6	4	6	6	4	6	4	5	7	5	6	[illegible]	6
Rheumatism	68	60	68	72	71	71	71	74	77	82	74	71	65	65	63	69	72	71
Scarlatina	21	21	25	23	15	19	25	30	23	27	23	19	16	12	11	13	13	16
Small-pox	1	4	0.2	0.4	0.4	2	1	0.4	1	[illegible]	7	4	3	1	0.4	0	2	5
Tonsilitis	....	...	....	45	49	48	65	65	65	58	41	40	26	26	30	40	62	61
Whooping-cough	23	21	21	23	32	16	20	16	14	11	16	15	21	13	18	13	17	16
No. of reports received	8571	3320	3221	3755	3991	3567	276	277	335	267	274	337	276	329	285	254	337	330

* This line is an average for such of the tabulated diseases as were reported present in the given month or year.

[The statements in this Exhibit for months in 1881 are graphically represented in Diagrams 1, 2, 3, 4, and 5, opposite this page and on following pages.]

in a community where it is supposed to have been suppressed. What is lacking to lessen this disease in Michigan is for all the people to think it worth while to be rid of it, and to act together, regardless of inconvenience and cost, for its extermination within the State and for its rigid exclusion from the State. The cost of a concerted, simultaneous, and successful action for the suppression of diphtheria throughout the State would be far less than that of the burden of sickness it continually causes, not to speak of the lives lost and to be lost by allowing the disease to continue. Though deaths of children do not usually attract so much attention as those of persons older and better known, the fact that for the year 1880 more deaths were reported in Michigan from diphtheria than from any other disease except consumption, is sufficient reason for regarding the suppression of diphtheria as a subject of great importance to the people of this State.

But if diphtheria were wholly suppressed in Michigan to-day, it would probably not be three days before the disease would again be introduced from some neighboring State or foreign country. Until there can be secured by concerted action of local, State, and National health authorities a suppression of diphtheria throughout the whole United States, and a rigid inspection of immigrants, it will be necessary for the people of Michigan to be continually on guard against the disease, and to fight it wherever it appears. But it is certainly important to put down the disease within our borders, and then wherever it may be introduced to make the fight short by making it quick and earnest from the first. To allow diphtheria to remain in a place month after month is not creditable.

Special reports of outbreaks of diphtheria in Michigan are printed on pages 344–55 and 364–82 of this Report. A study of climatic relations of the disease with especial reference to the season of its greatest prevalence, is printed on later pages of this article. Information of outbreaks of diphtheria, received by means of the weekly reports, has in many cases enabled the State Board of Health to send its documents to places when and where they were much needed.

CONSUMPTION.

Consumption (reported on an average for the five years 1877–81 on 66 per cent of the weekly reports) is another disease which should receive more attention from the people, with a view to its prevention and suppression. Recent experiments by Koch and others have made it appear very probable that consumption is caused by a microscopic bacillus,—an organism which is reproduced under favoring circumstances,—and that the disease is communicated from one person to another, and from one animal to another, by the conveyance of this bacillus to that other person or animal in the breath, the expectorations, or other discharges from the consumptive person; that the ways in which this communication may occur are numerous—even dried expectorations, broken up and blown about as fine dust in the air, and inhaled into inflamed or perhaps even into healthy air-passages and lungs, may convey the disease. Hence there is need for great caution in the care of those sick with consumption, to prevent a communication of the disease by methods already suggested. Though the chances of communication of consumption are not so great as with diphtheria or scarlet fever, the means to prevent its communication now seem to be similar,—avoidance of contact with, or inhalation of, infected matter directly or indirectly from the person sick, and prompt disinfection of all infected matter. Constant and free ventilation of the room of one sick with

[Continued on page 522.

TABLE 1.—*Stating, by Months in each of the Five Years ending December 31, 1881, also by a Monthly Average for each of those Years and for the entire period, by what Per Cent of Observers each of 26 Diseases was Reported Present (also the Number of Observers Reporting for the Month).—Compiled from Weekly Reports by Health Officers of Cities and Villages and from Regular Correspondents of the State Board of Health*—Diseases arranged by Year and Months in order of Greatest Number of Observers reporting them present in 1881.—**(Continued on pages 520-521.*

LINE NUMBER.	DISEASES.	OBSERVERS BY WHOM THE SEVERAL DISEASES WERE REPORTED PRESENT. — AVERAGE PER CENTS† (PER MONTH) OF THOSE MAKING REPORTS.					
		Average 1877-81.	1881.	1880.	1879.	1878.	1877.
	Average for Tabulated Diseases Reported Present	42	45	43	44	39	38
1	Intermittent fever	89	90	90	90	90	85
2	Rheumatism	83	84	85	85	81	78
3	Consumption, Pulmonary‡	74	78	76	78	76	61
4	Neuralgia‡	....	78	79	75	....	....
5	Bronchitis	74	74	77	75	75	71
6	Diarrhea	62	67	63	65	57	58
7	Remittent Fever‡	68	66	67	69	71	68
8	Tonsilitis‡	....	65	67	68	....	....
9	Pneumonia	59	60	62	60	58	56
10	Diphtheria	42	51	43	46	37	32
11	Influenza	54	48	54	57	57	54
12	Typho-malarial Fever‡	37	43	37	32	35	37
13	Erysipelas	40	42	45	43	36	35
14	Cholera Morbus	32	41	34	34	25	26
15	Measles	21	37	30	18	7	12
16	Dysentery	32	34	30	31	30	34
17	Scarlatina	33	32	26	36	38	33
18	Cholera Infantum	22	27	23	23	20	17
19	Inflammation of Bowels‡	....	26	25	....	....	....
20	Typhoid Fever (enteric)	21	26	21	18	16	22
21	Whooping-cough	31	24	42	31	28	28
22	Croup, Membranous	15	19	13	16	14	14
23	Cerebro-spinal Meningitis	8	16	6	5	6	6
24	Inflammation of Brain‡	....	12	13	....	....	....
25	Puerperal Fever	9	12	8	8	6	10
26	Small-pox	2	4	1	1	1	5
	Number of observers	....	116	112	110	97	115
	Average number of observers per month	70	70*	79	73	64	66

* For 1881 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit 35, page 523; the names of the observers and the number of the reports received from each are stated in Exhibit 36, pages 534-5.

† The numbers opposite the names of diseases state not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the average (for the twelve months of the year) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for each year is thus a statement for an average month of that year.

‡ Consumption, remittent fever, and typho-malarial fever were not printed on the first blanks used in making weekly reports (beginning with the month of September, 1876); neuralgia and tonsilitis were not printed on any blanks used prior to October, 1878, and not on all used for several months after that date; inflammation of brain and inflammation of bowels were not printed on any blanks used prior to July, 1879, and not on all used for several months after that date; hence it is probable that these diseases were not so fully reported at first as were the other diseases.

TABLE 1.—Continued.—*Per Cents. of Observers, by which the several Diseases were Reported Present, by Months in Each of the Five Years 1877-81.*

Per Cents. of Observers, by which Diseases were Reported Present.																					
	January.*							February.*							March.*						
Line Number.	Diseases.	Av. '77-81.	1881.	1880.	1879.	1878.	1877.	Diseases.	Av. '77-81.	1881.	1880.	1879.	1878.	1877.	Diseases.	Av. '77-81.	1881.	1880.	1879.	1878.	1877.
	Av. Disease..†	43	44	42	47	41	40	Av. Disease†..	42	44	42	44	40	38	Av. Disease .‡	42	46	44	46	39	38
1	Bronchitis.....	83	90	88	94	84	85	Pneumonia....	85	91	86	89	75	86	Rheumatism ..	87	93	88	87	83	79
2	Pneumonia.....	84	96	82	91	71	88	Bronchitis	89	90	94	92	82	89	Bronchitis . .	89	90	92	87	84	90
3	Rheumatism .	85	83	95	94	88	82	Rheumatism ..	87	87	92	89	82	86	Neuralgia ....‡	.	90	91	81		..
4	Neuralgia ...‡	..	81	84	67	..	..	Consumption ‡	74	84	77	78	79	52	Int. Fever. ..	82	86	84	83	85	71
5	Tonsilitis.....‡	..	81	78	77	..	..	Neuralgia ....‡	.	83	82	75	..	..	Consumption.‡	76	84	81	75	81	59
6	Int. Fever. ...	79	80	81	80	85	69	Int. Fever.. ..	78	79	90	78	83	69	Tonsilitis ....‡	.	82	79	81	..	..
7	Consumption ‡	75	79	74	80	77	64	Tonsilitis. ...‡		76	78	80		.	Pneumonia....	83	78	91	90	73	81
8	Influenza	73	67	75	86	86	78	Influenza......	75	71	78	88	62	78	Influenza......	73	70	75	83	62	72
9	Diphtheria ...	51	56	41	55	51	51	Diphtheria	47	60	45	52	39	38	Remit. Fever.‡	59	67	60	52	67	59
10	Remit Fever ‡	57	56	63	54	73	52	Remit. Fever.‡	55	56	54	47	65	51	Diarrhea.......	44	55	46	25	49	57
11	Erysipelas	47	41	46	45	47	49	Diarrhea......	39	51	39	34	45	27	Erysipelas	46	55	53	51	32	40
12	Diarrhea	42	44	45	36	40	43	Erysipelas	44	49	43	47	39	41	Measles........	28	65	41	14	5	16
13	Scarlatina. ...	42	40	34	61	34	44	Measles.	20	44	30	11	7	10	Diphtheria	43	51	49	43	39	35
14	Croup, Memb. .	29	30	20	38	22	33	Scarlatina	42	44	31	44	51	33	Scarlatina	44	45	34	52	52	34
15	Typho-Mal F.‡	30	30	30	22	34	24	Croup, Memb..	22	34	17	23	14	21	In. of Bowels‡	..	28	29	..	.	..
16	Whoop-cough.	32	40	39	30	19	34	In. of Bowels.‡	.	27	18	..	..	.	Croup, Memb..	19	25	14	22	14	22
17	Measles.	16	27	24	14	5	12	Typho-mal F.‡	24	27	29	20	24	18	Typho-mal Fe‡	25	22	26	19	26	31
18	Typhoid Fever	17	20	18	9	19	21	Whoop-cough.	29	23	40	33	18	32	Whoop cough.	28	22	45	30	15	29
19	In. of Bowels ‡	.	18	29	.		.	Cholera Morb..	11	17	7	9	18	3	Infl. of Brain.‡	..	18	13	.	.	..
20	Cholera Morb	9	11	10	5	7	10	Typhoid Fever	15	18	22	6	15	15	Cholera Morb..	12	18	14	10	14	6
21	Dysentery.....	13	11	16	11	16	12	Puerperal Fe..	8	13	6	8	8	7	Puerperal Fe..	13	16	6	13	8	19
22	Puerperal Fe..	12	11	8	13	12	16	Infl of Brain.‡		10	17	.	..	.	Cerebro spl. M	8	13	7	8	5	6
23	Cerebro-spl. M	5	10	2	5	7	3	Cerebro spl M.	6	7	2	5	7	8	Typhoid Fever	12	14	15	11	11	9
24	Infl of Brain.‡	..	9	13	.	..	..	Dysentery.....	11	7	14	9	10	13	Dysentery ...	13	12	13	14	12	12
25	Small pox. ...	3	3	1	0	0	10	Cholera Infan.	3	4	1	5	6	0	Cholera Inf....	5	4	4	8	8	1
26	Cholera Infan	4	0	5	5	5	3	Small-pox.....	2	1	1	0	0	6	Small-pox......	1	1	1	0	0	4
	Observers§	71	70	83	64	73	67	Observers .. §	73	70	87	64	71	71	Observers ....§	71	67	85	63	73	86

	April.*							May.*							June.*						
Line Number.	Diseases.	Av. '77-81.	1881.	1880.	1879.	1878.	1877.	Diseases.	Av. '77-81.	1881.	1880.	1879.	1878.	1877.	Diseases.	Av. '77-81.	1881.	1880.	1879.	1878.	1877.
	Av. Disease..†	42	47	41	45	38	38	Av. Disease...†	40	44	40	41	39	38	Av. Disease..†	40	43	46	41	35	34
1	Rheumatism ..	88	93	84	85	87	73	Int Fever	95	94	93	98	97	93	Int. Fever.....	95	96	96	98	92	96
2	Int. Fever.....	89	91	90	92	92	91	Rheumatism ..	86	89	83	90	80	83	Rheumatism ..	85	86	89	88	82	70
3	Bronchitis.....	83	88	80	93	79	80	Pneumonia....	68	63	65	67	68	57	Diarrhea	65	80	78	63	46	56
4	Neuralgia ....‡	..	84	82	78	..	..	Neuralgia.....‡	..	81	75	69	..	.	Neuralgia ... ‡	..	78	81	77	..	..
5	Measles	37	31	34	23	5	22	Bronchitis.....	76	80	74	78	73	70	Bronchitis....	66	72	77	66	66	46
6	Consumption‡	76	79	78	82	79	63	Measles	39	80	49	29	8	27	Consumption.‡	71	72	78	78	70	61
7	Pneumonia....	78	79	86	81	73	72	Consumption ‡	78	79	79	88	80	63	Remit Fever ‡	71	65	77	74	70	67
8	Tonsilitis‡.. ..	.	75	70	78		.	Remit. Fever.‡	69	67	69	68	65	72	Cholera Morb	43	64	57	33	30	39
9	Influenza......	65	68	57	78	63	59	Tonsilitis.....‡		60	65	71	.	..	Tonsilitis. . .‡	..	64	64	64	.	..
10	Remit. Fever.‡	61	62	6	62	62	58	Diarrhea.......	52	54	57	49	45	53	Measles	34	62	51	32	7	19
11	Diarrhea.......	48	54	41	48	40	33	Influenza......	53	49	46	51	62	57	Pneumonia . .	47	54	47	47	56	39
12	Diphtheria	41	49	43	42	38	31	Diphtheria ...	32	43	38	30	27	15	Diphtheria	31	45	32	45	23	18
13	Scarlatina....	39	46	41	47	32	38	Erysipelas	47	40	58	51	47	56	Erysipelas	40	42	49	49	26	38
14	Erysipelas.....	45	44	52	50	30	56	Scarlatina	32	37	23	33	33	33	Cholera Infan.	26	39	35	12	18	26
15	Cerebro spl. M.	12	34	5	40	3	6	Cholera Morb.	20	29	16	18	13	24	Dysentery.	26	36	35	16	26	28
16	Cholera Morb.	13	22	8	12	13	9	Cerebro-spl. M.	10	26	7	1	10	7	In of Bowels ‡		30	28			..
17	Whoop-cough	27	22	45	27	17	23	Whoop-cough .	32	26	51	24	37	33	Influenza.. ...	38	30	34	43	48	33
18	Typho-mal. F ‡	19	18	14	17	29	19	Typho-mal. F.‡	19	21	14	15	23	20	Scarlatina . ..	31	30	30	28	28	37
19	In. of Bowels‡	..	18	20	..	..	..	In. of Bowels‡	..	20	29		..	.	Whoop-cough .	32	28	51	25	25	32
20	Infl. of Brain‡.	..	15	12		..	..	Infl of Brain.‡		13	15	.		.	Cerebro-spl. M.	9	20	4	4	5	11
21	Croup, Memb..	15	13	13	22	18	13	Puerperal Fe.	9	13	6	7	8	10	Typho-mal. F.‡	23	19	30	21	25	21
22	Puerperal Fev	7	9	7	7	2	11	Croup, Memb..	10	11	7	14	10	6	Croup, Memb .	8	13	8	6	10	5
23	Small-pox......	4	9	1	0	0	8	Dysentery. ..	16	11	12	11	23	23	Typhoid Fever	10	12	8	6	11	11
24	Dysentery. ...	12	7	11	10	14	16	Cholera Infan.	6	16	5	1	7	7	Puerperal Fe.	9	12	14	6	5	9
25	Typhoid Fever	11	7	8	22	10	16	Typhoid Fever	9	9	7	7	10	15	Infl of Brain.‡	.	7	12		..	..
26	Cholera Infan	8	0	1	5	5	3	Small-pox.....	4	7	1	1	0	10	Small pox. .	3	6	0	4	9	5
	Observers. . §	68	66	83	60	63	64	Observers ....§	69	70	81	72	80	60	Observers ...§	68	69	74	81	61	57

* For 1881 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit 35, page 523; the names of the observers and the number of reports received from each are stated in Exhibit 36, pages 534-5.

† The numbers in this line are an average not for all diseases represented, but only for those reported present in the given month or year.

‡ See foot-note with this mark on page 519.

§ The numbers in this line state how many observers reported for the month in the given year.

TABLE 1.—CONTINUED.—*Per Cents of Observers, by which the several Diseases were Reported Present, by Months in each of the Years 1877–81.*

PER CENTS OF OBSERVERS BY WHICH DISEASES WERE REPORTED PRESENT.

JULY.* Diseases.	Av. '77-'81.	1881.	1880.	1879.	1878.	1877.
Av. disease †	43	48	47	46	40	36
Diarrhea	93	97	99	96	96	89
Interm. Fever	95	97	98	96	93	93
Cholera Morb's	77	87	86	82	81	67
Rheumatism	75	86	83	80	73	58
Consumption ‡	70	74	74	77	71	53
Dysentery	60	74	64	58	51	55
Remit. Fever ‡	73	71	74	80	60	69
Cholera Infan.	55	70	66	58	46	33
Neuralgia ‡	..	68	70	76	..	..
Bronchitis	55	58	65	55	61	37
Diphtheria	31	43	38	38	22	18
Tonsilitis ‡		43	45	48		
Erysipelas	37	40	40	54	27	25
Inf. of Bowels ‡	.	39	38	.	.	.
Measles	24	37	33	26	10	18
Pneumonia	34	36	34	39	39	24
Typho-mal F ‡	31	27	39	29	31	31
Scarlatina	26	27	16	29	25	25
Whoop. cough	31	27	45	33	27	35
Typhoid Fever	14	21	18	12	10	7
Inf. of Brain ‡	.	19	10	..		
Influenza	31	19	36	35	42	35
Cer.-sp. Men.	6	16	5	5	3	2
Croup, Memb.	3	9	3	1	2	2
Puerperal Fev	7	9	10	9	3	2
Small-pox	4	4	0	2	5	7
Observers §	69	70	80	92	50	55

AUGUST.* Diseases.	Av. '77-'81.	1881.	1880.	1879.	1878.	1877.
Av. disease †	45	48	48	45	41	40
Cholera Morb's	82	[illegible]	83	87	59	77
Diarrhea	97	99	99	99	94	98
Interm Fever	95	97	96	95	91	95
Dysentery	82	84	78	78	71	91
Cholera Infan	70	85	70	71	62	63
Rheumatism	70	82	73	69	65	57
Remit. Fever ‡	82	76	80	[illegible]	86	82
Consumption ‡	66	72	73	73	71	41
Neuralgia ‡	..	67	70	67		
Typho mal. F ‡	46	54	54	42	39	43
Bronchitis	56	41	58	53	56	34
Diphtheria	31	48	31	41	23	14
Tonsilitis ‡	..	39	50	49		
Inf. of Bowels ‡		34	30			
Typhoid Fever	25	33	28	23	18	25
Influenza	33	28	41	31	39	27
Measles	14	28	16	8	8	14
Whoop.-cough	34	28	50	27	30	34
Erysipelas	30	27	35	34	33	23
Pneumonia	26	27	29	25	26	24
Scarlatina	23	27	11	23	27	23
Inf. of Brain ‡	..	21	16			.
Puerperal Fev	7	13	8	2	6	7
Cer. spl. Men.	7	12	10	7	3	6
Croup, Mem.	5	9	6	5	2	5
Small-pox	2	1	0	0	2	5
Observers §	70	67	80	83	66	56

SEPTEMBER.* Diseases.	Av. '77-'81.	1881.	1880.	1879.	1878.	1877.	Line Number.
Av. disease †	46	48	49	49	45	40	
Diarrhea	97	97	99	96	96	[illegible]	1
Interm. Fever	95	95	97	96	91	93	2
Cholera Morb's	67	82	74	64	64	53	3
Dysentery	73	80	66	62	73	62	4
Consumption ‡	69	77	75	73	76	42	5
Remit. Fever ‡	80	77	79	77	84	80	6
Rheumatism	74	76	78	78	73	67	7
Typho-mal F ‡	65	74	71	67	60	63	8
Cholera Infan.	56	71	66	67	60	45	9
Neuralgia ‡		67	69	66			10
Bronchitis	60	53	64	63	65	49	11
Diphtheria	25	47	45	38	27	22	12
Typhoid Fever	31	45	30	31	22	28	13
Tonsilitis ‡		45	58	53			14
Pneumonia	32	32	23	42	35	23	15
Influenza	41	27	42	48	51	35	16
Inf. of Bowels ‡		26	32				17
Erysipelas	27	26	32	32	29	19	18
Whoop. cough	32	23	48	32	32	23	19
Scarlatina	24	20	20	25	35	22	20
Inf. of Brain ‡	.	12	16		..	..	21
Cer. spl. Men.	7	12	8	2	6	7	22
Croup, Memb.	9	12	8	9	6	10	23
Measles	9	11	13	14	3	6	24
Puerperal Fev	8	11	8	9	5	7	25
Small-pox	2	2	0	0	2	5	26
Observers §	69	66	77	91	63	60	

OCTOBER.* Diseases.	Av. '77-'81.	1881.	1880.	1879.	1878.	1877.
Av. disease †	46	45	44	49	47	44
Interm. Fever	94	94	96	91	97	93
Diarrhea	78	63	72	89	66	82
Rheumatism	84	80	82	89	82	81
Consumption ‡	78	78	74	78	79	71
Typho mal F ‡	62	77	67	57	70	72
Remit. Fever ‡	80	76	74	80	81	85
Neuralgia ‡		72	80	82		
Dysentery	45	57	50	41	43	56
Diphtheria	5	55	51	57	46	44
Bronchitis	71	54	75	75	79	70
Typhoid Fever	37	52	53	45	31	35
Tonsilitis ‡	..	52	64	72		
Cholera Morb's	31	45	25	38	15	30
Cholera Infan.	24	35	16	19	20	23
Erysipelas	36	35	41	30	43	32
Pneumonia	40	32	41	37	49	43
Influenza	46	29	47	42	50	55
Inf. of Bowels ‡		25	[illegible]			
Whoop. cough	30	18	32	32	41	26
Cer. spl. Men.	10	17	9	6	8	10
Croup, Memb.	14	15	14	11	16	12
Scarlatina	30	15	30	33	41	34
Puerperal Fev	9	11	9	11	5	10
Inf. of Brain ‡		8	16	.	.	
Measles	7	8	11	10	3	1
Small-pox	1	0	0	0	0	4
Observers §	73	65	74	79	81	82

NOVEMBER.* Diseases.	Av. '77-'81.	1881.	1880.	1879.	1878.	1877.
Av. disease ‡	42	45	40	44	39	40
Interm Fever	90	96	90	80	92	89
Rheumatism	84	84	81	84	80	80
Consumption ‡	76	81	73	74	73	73
Neuralgia ‡		81	77	78		
Bronchitis	80	90	90	75	79	87
Tonsilitis ‡		77	73	70		
Typho-mal F ‡	50	76	59	42	39	55
Remit Fever ‡	69	73	61	64	74	75
Diphtheria	53	61	53	55	49	46
Pneumonia	60	59	64	62	59	57
Diarrhea	53	56	48	59	41	54
Influenza	57	53	65	49	62	55
Typhoid Fever	32	46	31	30	15	35
Erysipelas	37	40	44	38	39	26
Inf. of Bowels ‡		30	17			.
Croup, Memb	21	24	17	19	28	16
Whoop. cough	30	24	29	34	43	22
Cholera Morb's	13	23	13	6	7	16
Dysentery	19	21	15	23	13	22
Scarlatina	31	30	28	32	30	37
Cer. spl. Men	5	14	4	0	5	3
Cholera Infan.	8	14	8	10	3	8
Puerperal Fev	10	13	8	8	8	11
Inf. of Brain ‡		10	9	.	.	
Measles	9	6	13	12	8	4
Small-pox	2	6	1	1	2	1
Observers §	71	70	73	73	61	76

DECEMBER.* Diseases.	Av. '77-'81.	1881.	1880.	1879.	1878.	1877.	Line Number.
Av. disease †	42	42	43	46	41	39	
Tonsilitis ‡	..	83	84	80	.	.	1
Bronchitis	86	92	88	92	85	91	2
Interm. Fever	82	82	83	81	80	82	3
Rheumatism	85	82	86	82	87	86	4
Neuralgia ‡		81	84	80			5
Consumption ‡	75	74	77	76	77	73	6
Pneumonia	73	65	77	75	77	71	7
Typho mal. F ‡	40	60	32	35	29	44	8
Remit. Fever ‡	63	59	64	67	51	72	9
Influenza	62	59	59	68	67	59	10
Diphtheria	54	56	57	60	54	41	11
Erysipelas	41	53	52	30	34	27	12
Diarrhea	41	45	42	49	36	33	13
Typhoid Fever	27	38	25	31	18	26	14
Scarlatina	37	32	39	37	51	36	15
Croup, Memb	25	25	26	32	25	19	16
Inf. of Bowels ‡		24	16			..	17
Whoop. cough	29	18	28	30	41	21	18
Puerperal Fev	7	16	4	7	3	5	19
Cer. spl. Men.	7	14	4	5	5	6	20
Cholera Morb's	11	11	17	11	8	9	21
Small-pox	3	10	0	3	0	0	22
Measles	13	9	19	20	10	6	23
Inf. of Brain ‡		5	7	.			24
Dysentery	13	8	10	23	11	15	25
Cholera Infan.	4	2	6	5	2	4	26
Observers §	74	84	89	75	61	70	

* For 1881 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit 35, page 522, the names of the observers and the number of the reports received from each are stated in Exhibit 38, pages 534–5.

† The numbers in this line are an *average*, not for all diseases represented, but only for those reported present in the given month or year.

‡ See foot-note with this mark on page 518.

§ The numbers in this line state how many observers reported for the month in the given year

consumption (of course without exposing the sick person to cold) is, probably, an important means of preventing communication of the disease. The close rooms in which such sick persons are often kept may, therefore, be a great injury both to those sick and to their attendants. It costs something properly to warm a sufficient supply of fresh air, especially in extreme cold weather, and in weather when to a well person moving about it seems hardly cold enough to keep a fire; and hence often the fresh air is carefully shut out at every crack of door and window, and no supply of warm fresh air is provided. But the cost of warming a supply of fresh air is a trifle in comparison with the benefit to the sick person and the increased comfort and safety of nurses and others who remain near the sick person.

A study of climatic relations of consumption is printed on following pages of this article.

PROPORTION OF OBSERVERS REPORTING DIFFERENT DISEASES.

Table 1, pages 519–21, states by months for each of the years 1877–81, and for an average month of that period, what per cent of the observers for the month reported the several diseases tabulated. It may be compared with Exhibit 4, pages 296–7, which states by months what per cent of observers reported many of the same diseases in reply to circulars issued at the close of each of the same years represented in Table 1. The most complete summary for the year 1881 is contained in Table 2, pages 524–33.

CEREBRO-SPINAL MENINGITIS.

For the year 1881, and for each month in that year, cerebro-spinal meningitis was reported present by a greater per cent of the observers than the average for the five years 1877–81, or for the corresponding months in those years. The greatest differences were in the months of April, May, June, and July. The per cents are stated, for each year and month, in Table 1, pages 519–21.

MEASLES.

For the year 1881 and for the first ten months of that year measles was reported present by a greater per cent of the observers than the average for the five years 1877–81, or for corresponding months in those years. For the months of March, April, May, and June, 1881, the increase in the prevalence of measles, as compared with the average for the above-named periods, was very great. The per cents for each of these periods are stated in Table 1, pages 519–21.

TYPHO-MALARIAL FEVER.

Beginning with August, 1881, and continuing through the year there seems to have been a large increase in prevalence of typho-malarial fever, as compared with the average for corresponding months in the years 1871–81. For the year 1881 typho-malarial fever was reported present by a greater proportion (greater by 6 per cent) of observers than the average for the five years 1877–81. The per cents are stated, by months, in Table 1, pages 519–21.

WINTER CHOLERA.

In the latter part of January and the first of February, 1881, there occurred, at several localities in the State, an epidemic of sickness which some observers were at a loss whether to call diarrhea or cholera morbus, and which several of them called "winter cholera." Comments on this disease were printed on pages lx. and 265–6 of the Report for 1881.

FOR THE	Av. No. of Reports per month, 297.	Influenza	48	73	35	3.5	128	668	242	-114	10.7	55.7	20.2	- 9.5
		Measles	37	70	26	4.4	100	503	190	- 90	8.8	41.9	15.8	- 7.5
		Neuralgia	78	83	65	4.3	198	1,384	297	- 99	16.5	115.3	24.8	- 8.3
		Pneumonia	60	69	41	5.4	213	779	228	- 13	17.8	64.9	18.8	- 1.1
		Puerperal Fever	12	44	5	8.2	41	76	65	- 24	3.4	6.3	5.4	- 2.0
		Rheumatism	84	84	71	4.6	204	1,429	470	-266	17.0	119.1	39.2	-22.2
		Scarlatina	32	58	19	6.7	74	226	236	-162	6.2	18.8	19.7	-13.5
		Small-pox	4	55	2	8.9	5	43	87	- 32	0.5	3.9	3.4	- 2.9
		Tonsilitis	65	73	48	4.5	142	959	305	-163	11.8	79.9	25.4	-18.6
		Whooping-cough	24	67	16	6.8	45	282	151	-106	3.8	23.5	12.6	- 8.8

* For Counties in each Division, see Exhibit 1, page 287.

† For Number of Observers, Reports, Weeks in each Month, etc., see Exhibit 35, page 523; for Names of observers and number of reports received from each, see Exhibit 36, pages 534-5.

[a] Not every one of the observers sent in a report for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks.

[b] The numbers in this column (pages 524-5) state not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the average (for the twelve months) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for the year is thus a statement for an average *month*. But on pages 526-9 the numbers in the "Per cent of Observers" column are statements for the months, and not averages. This column indicates the Area of Prevalence, except that in a few instances there were two or more observers in one city or village.

[c] This column states, for the year or given month, what per cent the number of reports which stated a disease to be present is of the number of card-reports received, for the given time, from such of the observers as reported the disease present. It is, therefore, an average not for all localities represented, but only for those at which the given disease was reported present. In the line "Average for Tabulated Diseases," it states what per cent the number of times *all* diseases were reported present is of the number of times they *might have been* so reported on the cards received, for the time specified, from the observers who during that time reported the diseases present (that is, if each of the observers had on every card he sent reported every disease present which he reported present at all). It will be seen that this is a more accurate average than would be obtained by dividing the sum of the column by the number of diseases reported present.

[d] This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State or division, as the case may be. It combines, and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence. Had every observer sent a report every week of the month or year, the numbers in this column would be (for the State) the product of the numbers in the same line in the two preceding columns.

[e] The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals (for the State) of the Order of Prevalence columns, in table 3, (a table giving statements for each locality, omitted in printing this Report, for want of room), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa;* but the greater the number of diseases reported present by each observer, from week to week, the greater will be the "average" in this column.

[f] The + sign indicates that the times reported "more" exceed those reported "less" than usually severe. The - sign, that the times reported "less" exceed those reported "more" than usually severe, the number of times by which either exceeds the other being indicated by the numbers stated.

[g] In this statement Ionia and the State House of Correction at Ionia, and Jackson and the State Prison at Jackson, are counted as separate localities.

TABLE 2.—WEEKLY REPORTS OF DISEASES IN MICHIGAN IN 1881.—*Exhibiting for the Year, and for Each Month of the Year Ending Saturday, December 31, 1881, a Summary relative to Diseases in the State of Michigan; also for each Month a Summary relative to Diseases in each of 10 Geographical Divisions* of the State,—Indicating (for the State) the Prevalence as regards Time and Area, and also the Comparative Severity of the Diseases.—Compiled from 3,567 Weekly Reports by 116 Observers, Health Officers of Cities and Villages and Regular Correspondents of the State Board of Health.*

NUMBER OF OBSERVERS, REPORTS, ETC.	DISEASES	(Av.b) Per Cent of Observers Reporting Presence of.	Av. Per Cent of Weeks Reported Present Where Present.c	Per Cent of Reports Stating Presence of.d	Av. Order of Prevalence Where Present.e	Times Reported More than Usually Severe.	Times Reported Usually Severe.	Times Reported Less than Usually Severe.	Difference Between "Times Reported More" and "Times Reported Less" than Usually Severe.f	Av. Times per Month Reported More than Usually Severe.	Av. Times per Month Reported Usually Severe.	Av. Times per Month Reported Less than Usually Severe.	Av. Difference bet'n "Times More" and "Times Less" Severe.f
YEAR ENDING DECEMBER 31, 1881.†	Average of Tabulated Diseases Reported Present	45	74	33	4.9	122.4	648.3	212.6	-90.2	10.8	54.1	17.8	-7.5
Whole No. of Localities	Brain, Inflammation of	19	44	5	6.7	34	50	71	- 37	2.8	4.2	5.9	- 3.1
represented,	Bowels, Inflammation of	26	51	14	7.4	71	218	112	- 41	5.9	17.6	9.3	- 3.4
91.8	Bronchitis	74	84	62	3.9	150	1,289	382	-232	12.5	107.4	31.8	-19.3
Av. No. of Localities	Cerebro-spinal Meningitis	16	54	9	7.9	87	91	80	+ 7	7.3	7.6	6.7	+0.6
represented per	Cholera Infantum	27	60	18	5.1	114	313	97	+17	11.4	31.8	9.7	+ 1.7
month, 62.8	Cholera Morbus	41	62	26	5.3	116	824	126	- 10	9.6	68.7	11.2	- 1.6
	Consumption, Pulmonary	78	91	71	5.6	106	1,948	122	- 16	8.8	162.3	10.2	- 1.3
Whole No. of Observers	Croup, Membranous	19	48	9	8.3	41	140	73	- 32	3.4	11.7	6.1	- 2.7
during the	Diphtheria	51	67	34	5.5	218	546	283	- 65	18.2	45.5	23.6	- 5.4
year, 116.	Diarrhea	67	77	52	3.0	197	1,018	339	-142	16.4	84.8	28.3	-11.8
Av. No. of Observers	Dysentery	34	67	23	6.1	128	362	210	- 82	10.7	30.2	17.5	- 6.8
per month, 70	Erysipelas	42	55	23	6.2	87	365	205	-118	7.3	30.4	17.1	- 9.8
	Fever, Intermittent	90	91	82	2.4	201	1,772	518	-317	16.6	147.7	43.2	-26.4
Total No. of Reports	Fever, Remittent	66	82	54	2.5	200	1,049	336	-136	16.7	88.9	28.0	-11.3
Compiled, 3,567 a	Fever, Typhoid (Enteric)	26	67	15	6.2	114	287	159	- 45	9.6	28.9	13.3	- 3.6
	Fever, Typho-malarial	43	69	29	3.9	168	495	187	- 19	14.1	41.3	15.6	- 1.6

FOR THE	Av. No. of Reports per month, 297.	Influenza	48	73	35	3.5	128	668	242	-114	10.7	55.7	20.2	- 9.5
		Measles	37	70	26	4.4	100	503	190	- 90	8.8	41.9	15.8	- 7.5
		Neuralgia	78	83	65	4.3	198	1,384	297	- 99	16.5	115.3	24.8	- 8.3
		Pneumonia	60	69	41	5.4	213	779	226	- 13	17.8	64.9	18.8	- 1.1
		Puerperal Fever	12	44	5	8.2	41	76	65	- 24	3.4	6.3	5.4	- 2.0
		Rheumatism	84	84	71	4.6	204	1,429	470	-266	17.0	119.1	39.2	-22.2
		Scarlatina	32	58	19	6.7	74	226	236	-162	6.2	18.8	19.7	-13.5
		Small-pox	4	55	2	8.9	5	43	37	- 32	0.5	3.9	3.4	- 2.9
		Tonsilitis	65	73	48	4.5	142	959	305	-163	11.8	79.9	25.4	-13.6
		Whooping-cough	24	67	16	6.3	45	282	151	-106	3.8	23.5	12.6	- 8.8

* For Counties in each Division, see Exhibit 1, page 287.

† For Number of Observers, Reports, Weeks in each Month, etc., see Exhibit 35, page 523; for Names of observers and number of reports received from each, see Exhibit 36, pages 534–5.

[a] Not every one of the observers sent in a report for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks.

[b] The numbers in this column (pages 524–5) state not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the average (for the twelve months) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for the year is thus a statement for an average *month*. But on pages 526–9 the numbers in the "Per cent of Observers" column are statements for the months, and not averages. This column indicates the Area of Prevalence, except that in a few instances there were two or more observers in one city or village.

[c] This column states, for the year or given month, what per cent the number of reports which stated a disease to be present is of the number of card-reports received, for the given time, from such of the observers as reported the disease present. It is, therefore, an average not for all localities represented, but only for those at which the given disease was reported present. In the line "Average for Tabulated Diseases," it states what per cent the number of times *all* diseases were reported present is of the number of times they *might have been* so reported on the cards received, for the time specified, from the observers who during that time reported the diseases present (that is, if each of the observers had on every card he sent reported every disease present which he reported present at all). It will be seen that this is a more accurate average than would be obtained by dividing the sum of the column by the number of diseases reported present.

[d] This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State or division, as the case may be. It combines, and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence. Had every observer sent a report every week of the month or year, the numbers in this column would be (for the State) the product of the numbers in the same line in the two preceding columns.

[e] The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals (for the State) of the Order of Prevalence columns, in table 3, (a table giving statements for each locality, omitted in printing this Report, for want of room), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa;* but the greater the number of diseases reported present by each observer, from week to week, the greater will be the "average" in this column.

[f] The + sign indicates that the times reported "more" exceed those reported "less" than usually severe. The - sign, that the times reported "less" exceed those reported "more" than usually severe, the number of times by which either exceeds the other being indicated by the numbers stated.

[g] In this statement Ionia and the State House of Correction at Ionia, and Jackson and the State Prison at Jackson, are counted as separate localities.

TABLE 2.—CONTINUED.—*Diseases in the State,—January to June, 1881.* (*For foot-notes and full tabular heads, see pages 524–5.*)

Months.†	DISEASES.	Per ct. of Observers Reporting Pres. of *b*	Av. per ct. of Weeks Reported Present where Present *a,c*	Per cent of Reports Stating Pres'nce of *d*	Av. Order of Preva-lence where Pres. *e*	Times Rep'ted More than usually Severe.	Times Reported Usually Severe.	Times Rep't'ed Less than usually Severe.	Difference between Times "More" and "Less" severe. *f*	Months.†	Per ct. of Observers Reporting Pres. of *b*	Av. per ct. of Weeks Reported Present where Present *a,c*	Per cent of Reports Stating Pres. of *d*	Av. Order of Preva-lence where Pres. *e*	Times Rep'ted More than usually Severe.	Times Reported Usually Severe.	Times Rep'ted Less than usually Severe.	Difference between Times "More" and "Less" Severe. *f*	Months †	Per ct. of Observers Reporting Pres. of *b*	Av. per ct. of Weeks Reported Present where Present *a,c*	Per cent of Reports Stating Pres. of *d*	Av. Order of Preva-lence where Pres. *e*	Times Rep't'd More than usually Severe	Times Reported Usually Severe.	Times Rep't'ed Less than usually Severe.	Difference between Times "More" and "Less" Severe. *f*
	Av. for Tab. Dis. Reptd. Pres.	44	77	34	4.7	8.9	51.1	16.8	-7.9		44	77	34	5.0	9.1	51.5	17.0	-7.9		46	73	32	4.9	9.2	62.3	19.3	-10.1
January.†	Brain, Inflammation of..	9	42	4	9.0	0	4	4	- 4	February.†	10	46	5	7.9	1	4	5	- 4	March.†	16	35	6	6.8	4	4	8	- 4
	Bowels, Inflammation of	19	56	11	8.7	4	14	9	- 5		27	47	13	8.2	9	18	8	+ 1		28	53	15	7.1	7	27	12	- 5
	Bronchitis..............	90	95	86	2.9	24	145	28	- 4		90	96	86	3.0	29	134	34	- 5		90	92	80	3.1	16	166	41	-25
	Cerebro spi. Meningitis.	10	44	4	6.9	1	5	2	- 1		7	44	3	5.6	4	3	1	+ 3		13	35	5	7.6	4	6	6	- 2
	Cholera Infantum	0	0	0	0	0	0	0	0		4	25	1	4.0	0	0	3	- 3		4	20	1	7.7	1	1	1	0
	Cholera Morbus..........	11	39	4	7.0	1	6	4	- 3		17	46	8	7.3	2	8	5	- 3		16	38	6	6.9	3	6	8	- 5
	Consumption, Pulmon'ry	79	94	74	5.5	14	157	9	+ 5		84	90	76	5.8	9	168	5	+ 4		84	90	73	5.8	12	195	4	+ 8
	Croup, Membranous.....	30	52	16	6.8	7	14	9	- 2		33	57	19	7.0	5	23	8	- 3		25	51	13	7.8	5	18	9	- 4
	Diphtheria	56	66	36	5.3	11	55	22	-11		60	65	39	5.5	12	53	25	-13		51	59	29	6.1	14	50	23	- 9
	Diarrhea..................	44	66	29	5.1	7	33	21	-14		51	63	32	5.8	13	37	23	-10		55	60	33	5.7	9	53	31	-22
	Dysentery.................	11	44	5	8.1	2	1	7	- 5		7	60	4	7.2	1	4	7	- 6		12	44	5	8.0	3	5	7	- 4
	Erysipelas	49	62	30	6.2	10	39	16	- 6		49	57	28	6.7	6	39	16	-10		55	54	29	6.3	15	47	20	- 5
	Fever, Intermittent.....	80	84	67	3.3	8	97	50	-42		79	88	69	3.3	9	101	51	-42		85	83	70	3.0	11	137	49	-38
	Fever, Remittent.... ...	56	88	49	4.1	9	69	28	-19		56	79	45	4.5	4	61	31	-27		57	76	41	3.9	8	62	36	-28
	Fever, Typhoid (enteric)	20	66	13	6.9	8	13	7	+ 1		16	61	10	8.9	8	6	11	- 3		13	56	7	8.0	3	16	10	- 7
	Fever, Typho-malarial..	30	56	17	6.1	5	18	14	- 9		27	62	17	7.4	3	19	15	-12		22	62	13	8.0	3	25	7	- 4
	Influenza..................	67	84	57	2.2	26	88	21	+ 5		71	89	64	2.2	28	107	16	+12		70	86	59	2.3	20	123	22	- 2
	Measles....................	27	73	19	5.1	9	18	13	- 4		44	67	30	5.0	1	48	17	-16		55	72	39	4.1	5	76	26	-21
	Neuralgia	81	85	69	4.3	13	121	21	- 8		83	90	75	4.8	17	123	26	- 9		90	83	72	4.1	19	150	32	-13
	Pneumonia................	88	81	69	4.2	27	109	24	+ 3		91	80	73	4.6	28	115	22	+ 6		78	81	62	4.8	17	123	27	-10
	Puerperal Fever..........	11	34	4	6.6	1	4	5	- 4		13	47	6	7.6	5	9	2	+ 3		16	38	6	7.6	4	12	2	+ 2
	Rheumatism	88	86	71	4.4	16	103	38	-22		87	85	74	4.5	20	118	36	-16		93	85	77	4.2	24	154	40	-16

	Small-pox	5	35	1	5.0	0	2	1	- 1		1	25	0.4	4.0	0	0	1	- 1		1	60	1	6.0	0	1	4	0
	Tonsillitis	61	60	65	3.9	8	110	28	-20		76	86	65	4.0	13	103	32	-19		69	89	65	4.0	28	123	41	-18
	Whooping-cough	30	67	20	6.3	9	21	21	- 12		23	69	16	6.0	4	18	17	-18		29	63	14	6.1	0	21	13	-12
	Av. for Tab. Dis. Reptd. Pres.	47	75	35	4.8	9.6	50.6	19.1	-9.6		44	72	31	4.8	9.6	40.7	17.2	-7.6		45	68	30	4.9	10.4	55.0	20.1	-9.7
	Brain, Inflammation of	15	45	7	6.6	5	5	4	+ 1		13	36	5	9.1	6	0	5	+ 1		7	50	4	10.6	1	3	7	- 6
	Bowels, Inflammation of	16	55	8	7.3	3	7	9	- 6		20	58	7	5.9	5	5	6	- 1		30	46	14	7.0	10	21	10	0
	Bronchitis	68	39	78	3.3	10	127	38	-29		80	78	62	3.6	11	89	40	-20		72	73	53	4.8	10	93	40	-30
	Cerebro-spi. Meningitis	34	55	18	6.7	17	14	10	+ 7		26	80	20	6.9	21	21	6	+ 15		20	52	11	6.9	9	11	8	+ 1
	Cholera Infantum	0	0	0	0	0	0	0	0		10	25	3	8.6	4	1	1	+ 3		30	45	17	6.3	9	18	18	- 9
	Cholera Morbus	22	42	9	6.7	2	13	3	- 1		29	45	13	6.2	7	18	5	+ 2		64	40	26	5.2	12	46	18	- 6
	Consumption, Pulmon'ry	79	95	76	5.7	7	157	7	0		79	[redacted]	69	5.2	4	148	12	- 8		72	93	68	5.2	9	176	11	2
	Croup, Membranous	13	64	9	8.9	2	6	6	4		11	48	5	8.5	3	7	8	+ 2		13	38	5	9.1	1	9	6	5
	Diphtheria	49	66	32	5.6	16	39	20	- 4		43	78	33	6.1	14	40	22	- 8		45	59	26	6.3	19	32	22	- 3
	Diarrhoea	54	60	33	5.4	9	43	24	-15		34	70	38	5.2	9	55	22	-13		80	70	53	5.7	18	103	41	-23
	Dysentery	7	45	8	7.2	0	5	4	- 4		11	44	5	7.3	4	3	6	- 2		36	49	18	5.4	10	24	16	- 6
April.†	Erysipelas	44	56	25	6.0	7	31	19	12	May.†	40	66	22	5.6	3	31	20	-17	June.*	42	55	23	5.9	7	27	28	-16
	Fever, Intermittent	91	91	94	2.5	16	133	45	-20		94	93	88	2.0	22	142	44	-22		96	95	91	1.7	32	186	49	-17
	Fever, Remittent	62	84	52	3.2	11	75	29	-16		67	84	57	3.1	12	87	27	-15		65	85	55	3.2	29	94	27	+ 2
	Fever, Typhoid (enteric)	7	70	5	9.2	1	4	7	- 6		9	71	8	8.7	0	9	8	- 8		12	61	6	8.6	3	4	12	- 9
	Fever, Typho-malarial	18	51	9	7.0	3	11	8	5		24	56	13	5.2	9	17	4	+ 6		19	49	9	6.8	6	13	11	- 5
	Influenza	66	77	52	3.3	6	65	44	-36		49	61	30	4.1	3	33	31	-26		30	62	19	5.1	1	34	16	-15
	Measles	61	75	61	3.9	32	82	26	+ 6		80	78	62	3.3	20	98	32	-12		62	70	44	3.8	17	91	18	- 1
	Neuralgia	84	66	72	4.2	17	111	31	-14		81	79	64	4.1	21	96	24	- 3		78	90	63	3.9	19	124	33	-14
	Pneumonia	79	77	61	5.0	25	86	22	+ 3		83	61	51	5.1	26	68	29	- 3		34	52	28	5.3	9	41	19	-10
	Puerperal Fever	9	50	4	7.7	5	5	3	+ 2		13	47	6	8.8	4	10	3	+ 1		12	35	4	10.3	3	3	7	- 4
	Rheumatism	93	89	82	4.4	17	130	37	-20		89	84	74	4.3	15	120	35	-30		86	83	71	4.1	18	140	43	-27
	Scarlatina	46	58	27	6.7	14	19	20	-15		37	61	25	6.2	10	21	24	-14		30	61	19	6.7	7	26	20	-18
	Small-pox	9	46	4	7.5	0	7	5	- 5		7	90	7	8.8	1	13	4	- 3		6	65	4	10.5	0	8	5	- 5
	Tonsillitis	73	74	56	4.5	11	76	39	-22		60	68	41	4.9	11	57	27	-16		64	63	40	4.8	10	71	26	-18
	Whooping-cough	22	61	11	6.8	1	12	9	- 8		26	69	15	6.2	3	24	8	- 5		28	56	15	6.2	1	31	12	-11

TABLE 2.—CONTINUED.—*Diseases in the State,—July to December, 1881.* (*For foot-notes and full tabular heads, see pages 524–5.*)

Months.†	Diseases.	Per ct. of Observers Report'g Pres. of b	Av. per ct. of Weeks Reported Present where Present. a,c	Per ct. of Reports Stating Pres. of. d	Av. Order of Prevalence where Pres. e	Times Rept'd More than usually Severe.	Times Rep'ted Usually severe.	Times Rep'ted Less than usually Severe.	Difference between Times "More" and "Less" Severe. f
July.†	Av. for Tab. Dis. Reptd. Pres.	46	74	34	5.1	10.5	51.8	15.6	-5.1
	Brain, Inflammation of..	10	45	8	8.8	4	7	7	- 3
	Bowels, Inflammation of	39	51	20	7.9	9	27	7	+ 2
	Bronchitis	53	72	38	5.4	3	55	23	-20
	Cerebro-spi Meningitis.	16	52	8	8.8	6	4	10	- 4
	Cholera Infantum	70	73	51	4.3	25	73	18	+ 7
	Cholera Morbus	87	84	74	4.1	28	119	22	+ 6
	Consumption, Pulmonary	74	89	67	5.6	7	141	11	- 4
	Croup, Membranous	9	48	4	10.7	0	2	6	- 6
	Diphtheria	43	58	25	7.1	9	28	25	-16
	Diarrhea	97	93	91	2.4	41	150	21	+20
	Dysentery	74	75	56	4.2	30	73	24	+ 6
	Erysipelas	40	46	17	5.8	8	15	11	- 3
	Fever, Intermittent	97	94	92	2.0	17	174	25	- 8
	Fever, Remittent	71	81	58	3.8	15	85	27	-12
	Fever, Typhoid (Enteric)	21	57	12	8.8	6	13	13	- 7
	Fever, Typho-malarial..	27	62	18	6.6	9	20	9	0
	Influenza	19	46	9	7.2	3	11	7	- 4
	Measles	87	69	26	4.2	8	43	14	- 6
	Neuralgia	69	80	55	4.8	8	85	27	-19
	Pneumonia	36	50	18	7.7	6	26	10	- 4
	Puerperal Fever	9	58	5	9.3	3	2	7	- 4
	Rheumatism	80	81	65	5.1	12	96	40	-28

Months.†	Diseases.	Per ct. of Observers Report'g Pres. of b	Av. per ct. of Weeks Reported Present where Present. a,c	Per ct. of Reports Stating Pres. of. d	Av. Order of Prevalence where Pres. e	Times Rept'd More than usually Severe.	Times Rep'ted Usually Severe.	Times Rep'ted Less than usually Severe.	Difference between Times "More" and "Less" Severe. f
August.†	Av. for Tab. Dis. Reptd. Pres.	48	77	37	5.3	15.0	67.3	18.9	-4.0
	Brain, Inflammation of..	21	43	9	8.8	9	9	6	+ 3
	Bowels, Inflammation of	34	63	21	7.6	10	40	4	+ 6
	Bronchitis	49	75	37	6.0	4	71	25	-21
	Cerebro-spi Meningitis.	12	60	7	10.9	6	8	8	- 2
	Cholera Infantum	85	81	69	4.1	49	122	18	+31
	Cholera Morbus	100	84	84	4.1	41	161	24	+17
	Consumption, Pulmonary	72	92	67	6.2	4	176	9	- 5
	Croup, Membranous	9	45	4	13.3	3	3	7	- 4
	Diphtheria	48	61	29	6.4	18	48	23	- 5
	Diarrhea	99	97	95	1.8	51	179	23	+31
	Dysentery	93	87	80	3.9	51	111	62	-11
	Erysipelas	27	58	16	7.8	9	23	14	- 5
	Fever, Intermittent	97	97	94	2.4	23	199	36	-13
	Fever, Remittent	76	83	63	4.0	24	125	21	0
	Fever, Typhoid (Enteric)	33	68	23	6.5	10	26	20	-10
	Fever, Typho-malarial..	54	56	30	6.3	10	51	15	- 5
	Influenza	28	55	16	5.9	7	23	14	- 7
	Measles	28	56	16	6.9	6	24	19	-13
	Neuralgia	67	82	54	5.2	9	116	20	-11
	Pneumonia	27	50	14	9.4	7	18	18	-11
	Puerperal Fever	13	53	7	10.9	3	7	13	-10
	Rheumatism	82	70	65	5.5	21	111	42	-21

Months.†	Diseases.	Per ct. of Observers Report'g Pres. of b	Av. per ct. of Weeks Reported Present where Present. a,c	Per ct. of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Times Rept'd More than usually Severe.	Times Rep'ted Usually Severe.	Times Rep'ted Less than usually Severe	Difference between Times "More" and "Less" Severe. f
September.†	Av. for Tab. Dis. Reptd. Pres.	46	77	36	5.1	9.3	51.6	14.4	-5.1
	Brain, Inflammation of..	12	56	7	9.9	2	6	5	- 3
	Bowels, Inflammation of	26	54	13	7.8	2	13	7	- 5
	Bronchitis	53	82	44	6.3	8	73	16	- 8
	Cerebro-spi Meningitis.	12	59	7	9.9	3	6	7	- 4
	Cholera Infantum	71	71	51	4.6	20	69	23	- 3
	Cholera Morbus	82	70	58	4.9	9	88	28	- 19
	Consumption, Pulmonary	77	90	70	6.2	9	130	9	0
	Croup, Membranous	12	44	5	11.9	0	8	4	- 4
	Diphtheria	47	70	33	5.9	24	36	12	+12
	Diarrhea	97	93	90	2.6	16	141	41	-25
	Dysentery	80	76	62	4.6	15	85	38	-23
	Erysipelas	26	61	15	7.1	1	19	10	- 9
	Fever, Intermittent	95	96	92	1.9	19	169	15	+ 4
	Fever, Remittent	77	85	66	2.9	21	111	14	+ 7
	Fever, Typhoid (Enteric)	45	76	35	5.3	21	51	13	+ 8
	Fever, Typho-malarial..	74	77	57	4.7	26	71	20	+ 6
	Influenza	27	62	17	5.8	2	26	14	-12
	Measles	11	75	8	10.0	0	5	12	-12
	Neuralgia	67	83	57	4.9	13	94	15	- 2
	Pneumonia	32	62	19	7.8	4	35	6	- 2
	Puerperal Fever	11	50	5	9.9	3	3	4	- 1
	Rheumatism	76	83	63	5.7	12	89	32	-20

	Small-pox	4	75	3	16.0	0	4	4	- 4		1	80	1	24.0	0	0	5	- 5		5	26	6.4	8.5	0	1	0	0
	Tonsillitis	48	61	26	5.7	6	40	18	- 7		39	67	[illegible]	6.4	3	54	9	- 6		45	66	30	6.2	2	51	12	-10
	Whooping cough	27	78	21	5.9	3	35	15	-12		28	63	16	7.2	5	34	15	-10		23	75	18	5.5	5	24	8	- 8
OCTOBER.	Av. for Tab. Dis. Reptd. Pres.	45	77	35	5.1	10.4	49.7	13.8	-3.4	NOVEMBER.	45	71	32	4.8	10.1	69.1	21.0	-10.9	DECEMBER.	42	72	31	4.8	11.5	52.4	21.3	-9.8
	Brain, Inflammation of	8	55	4	12.4	0	0	8	- 6		10	43	4	10.1	1	4	6	- 5		8	43	3	8.0	1	4	6	- 5
	Bowels, Inflammation of	25	49	12	7.3	5	9	8	- 3		30	48	12	7.8	4	13	15	-11		24	57	14	6.2	3	19	17	-14
	Bronchitis	54	82	44	4.8	9	67	19	-10		80	84	66	3.6	13	141	30	-17		62	84	68	3.1	13	126	48	-35
	Cerebro spl. Meningitis	17	49	8	8.0	9	6	5	+ 4		14	45	7	8.9	4	6	7	- 3		14	46	7	7.0	3	1	10	- 7
	Cholera Infantum	35	52	19	6.6	2	20	10	- 6		13	34	4	7.6	3	6	3	0		2	50	1	9.0	1	4	2	- 1
	Cholera Morbus	45	52	23	6.4	1	35	8	- 7		23	41	10	6.9	5	14	5	0		11	45	5	6.1	4	8	4	0
	Consumption, Pulmonary	78	93	73	5.3	4	144	13	- 9		81	92	74	5.4	16	186	18	- 2		74	90	67	4.8	11	168	14	- 8
	Croup, Membranous	15	40	6	5.3	4	7	5	- 1		24	46	11	7.8	6	21	3	+ 3		26	43	11	7.1	8	[illegible]	7	- 4
	Diphtheria	[illegible]	80	44	5.4	27	69	20	+ 7		61	68	42	4.9	27	[illegible]	34	- 7		56	72	40	4.3	27	50	25	- 8
	Diarrhea	85	83	70	3.9	12	97	43	-31		58	65	38	5.1	2	79	25	-23		45	67	30	4.6	7	48	24	-17
	Dysentery	57	58	31	5.8	8	38	21	-13		21	39	9	7.9	2	6	14	-12		8	43	3	5.1	2	5	4	- 2
	Erysipelas	35	51	18	6.8	9	15	14	- 5		40	54	21	6.8	3	36	16	- 12		58	53	28	5.0	9	43	27	-18
	Fever, Intermittent	94	97	91	2.0	15	160	25	- 8		96	87	83	2.3	18	152	78	-65		89	84	69	2.5	16	123	63	-37
	Fever, Remittent	75	90	69	3.1	30	102	20	+ 10		78	76	56	5.2	[illegible]	92	43	-21		59	80	47	3.4	15	80	30	-15
	Fever, Typhoid (Enteric)	52	71	37	4.9	19	44	14	+ 5		46	69	32	5.2	15	58	26	- 11		36	[illegible]	25	5.1	20	43	[illegible]	+ 2
	Fever, Typho-malarial	77	91	70	3.6	35	94	17	+ 18		76	81	61	3.9	32	102	44	- 12		[illegible]	66	40	4.5	28	54	23	+ 5
	Influenza	28	66	18	4.8	5	23	7	- 2		53	65	34	3.8	8	58	21	-13		59	71	42	3.0	17	67	29	-12
	Measles	8	65	5	8.4	0	10	3	- 3		6	50	3	9.5	1	4	6	- 5		9	84	3	5.0	1	4	4	- 3
	Neuralgia	72	80	58	4.7	16	89	16	0		81	83	67	4.1	16	149	22	- 6		81	83	67	3.6	30	127	30	0
	Pneumonia	32	65	21	7.3	14	27	3	+ 11		59	61	36	5.8	16	54	24	- 6		65	73	47	4.4	32	77	22	+ 10
	Puerperal fever	11	54	6	9.1	2	9	3	- 1		13	35	4	7.1	2	8	7	- 5		16	38	6	6.4	6	4	9	- 3
	Rheumatism	80	87	[illegible]	4.8	15	96	35	-20		84	86	72	4.2	19	141	41	-22		82	[illegible]	71	3.9	15	159	49	-34
	Scarlatina	15	85	13	7.8	2	8	12	-10		20	[illegible]	13	7.9	4	13	20	-16		32	51	16	5.6	5	19	28	-18
	Small-pox	0	0	0	0	0	0	6	0		6	25	2	9.0	2	3	1	+ 1		10	47	5	7.2	2	4	11	- 9
	Tonsillitis	52	75	40	5.2	15	[illegible]	14	+ 1		77	68	52	3.9	18	[illegible]	23	- 8		88	74	61	3.6	22	114	39	-17
	Whooping-cough	18	71	13	7.2	3	21	4	-1		24	67	17	5.5	6	26	15	- 9		16	88	16	6.2	5	16	15	-10

TABLE 2.—CONTINUED.—*Diseases in the Upper-Peninsular, the North-Western, the Western, the Northern-Central, and the Bay-and-Eastern Divisions* of the State, for the Years 1880 and 1881, and by Months,† in 1881.—Per Cent of Weekly Reports which Stated Presence of Diseases Named.*[a]

Div.*	DISEASES.	1880.	1881.†	Jan.	Feb.	Div.*	1880.	1881.†	Jan.†	Feb.†	Mar.†	Apr.†	Div.*	1880.	1881.†	Jan.†	Feb.†	Mar.†	Apr.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†
Upper-Peninsular Division.*	Av for Tab. Dis. Reported Pres.	27	33	55	67	Northwestern Division.*	34	35	43	44	42	48	Western Division.*	38	41	48	46	43	43	47	42	45	48	47	45	40	42
	Brain, Inflammation of	2	8	0	13		4	4	0	0	0	13		6	7	3	0	0	0	4	17	18	21	25	15	4	0
	Bowels, Inflammation of	24	35	25	38		9	6	0	13	0	0		15	15	13	6	24	4	0	17	17	21	25	25	25	15
	Bronchitis	56	65	100	100		59	88	100	88	60	100		70	65	88	81	79	75	71	63	26	25	44	45	71	77
	Cerebro-spinal Meningitis	1	0	0	0		2	3	14	0	0	13		3	10	9	9	6	17	25	10	4	4	25	20	0	4
	Cholera Infantum	12	17	0	0		36	26	0	0	0	0		23	24	0	3	3	0	4	53	78	92	88	25	25	11
	Cholera Morbus	13	25	0	0		25	16	0	0	0	0		30	32	13	13	24	17	33	30	83	83	38	35	25	15
	Consumption, Pulmonary	62	100	100	100		34	19	0	25	20	13		55	66	76	72	67	67	67	63	52	63	75	60	61	69
	Croup, Membranous	6	8	25	0		12	15	29	25	0	38		7	13	23	28	21	8	0	3	0	13	0	10	18	8
	Diphtheria	2	2	13	0		13	19	29	0	0	25		49	62	81	61	54	54	75	57	48	67	69	80	50	36
	Diarrhea	64	57	50	50		56	54	0	25	40	25		53	55	41	47	45	42	50	47	100	100	94	66	25	42
	Dysentery	18	25	0	0		35	32	0	0	0	0		33	32	26	25	30	17	17	30	61	79	50	30	18	19
	Erysipelas	23	23	0	0		38	7	14	13	10	0		37	34	47	56	38	29	42	30	17	21	25	30	25	35
	Fever, Intermittent	4	2	0	0		73	88	57	75	70	100		89	90	75	78	79	92	88	100	100	100	100	100	100	81
	Fever, Remittent	5	10	0	0		46	47	0	0	0	13		75	78	84	78	70	79	83	73	83	92	66	90	64	58
	Fever, Typhoid (Enteric)	14	75	25	25		13	2	0	0	0	0		13	21	13	16	16	17	17	17	17	33	44	35	25	19
	Fever, Typho-malarial	1	0	0	0		30	26	14	0	0	13		29	42	22	19	30	23	28	28	22	55	75	70	64	81
	Influenza	65	47	100	100		45	47	29	13	10	75		52	45	47	59	55	42	42	53	22	29	38	45	51	66
	Measles	18	53	25	13		4	60	71	50	20	38		22	25	47	28	6	46	54	37	39	25	13	0	0	0
	Neuralgia	67	50	50	25		59	96	71	100	90	100		81	79	91	88	91	79	75	80	74	75	75	75	71	66
	Pneumonia	43	47	38	75		45	19	29	13	10	25		46	60	91	94	88	71	75	37	30	29	25	20	43	77
	Puerperal Fever	1	5	0	0		8	2	0	0	0	0		7	13	13	19	18	17	17	17	17	21	0	0	7	0
	Rheumatism	74	47	100	100		78	91	71	63	90	100		64	69	81	88	85	83	79	70	53	50	56	60	46	62
	Scarlatina	16	26	63	50		0	12	0	25	10	13		36	35	50	81	12	25	38	50	43	33	38	40	29	31
	Small-pox	0	0	0	0		0	0	0	0	0	0		0.6	1	0	0	0	0	0	0	0	0	0	0	4	8
	Tonsillitis	38	32	13	0		58	56	57	88	70	63		65	66	83	88	79	63	63	70	39	50	44	45	71	58
	Whooping-cough	36	13	0	0		22	23	14	0	0	0		32	20	23	24	12	17	21	40	33	21	13	5	0	0

For the U. P and N. W. Divisions, for months not represented on this page, statements are given in Table 3 There being but one observer for those months the "per cent of reports" is the same as the "per cent of weeks" there given.

Div.*	DISEASES.	1880.	1881.†	Jan.†	Feb.†	Mar.†	Apr.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†
NORTHERN-CENTRAL DIVISION.*	Av. for Tab. Diseases Reported Present....	33	31	37	38	38	51	47	44	32	50	41	47	37	35
	Brain, Inflam. of.....	0	9	0	0	0	33	30	0	0	0	0	0	15	17
	Bowels, Inflam. of...	1	12	33	38	10	0	10	0	13	0	13	0	8	25
	Bronchitis	45	50	50	50	50	67	60	50	25	50	38	33	54	58
	Cerebro-spinal Men..	5	16	0	0	10	50	50	40	13	0	0	0	23	8
	Cholera Infantum.....	20	11	0	0	10	0	0	10	13	50	50	13	0	0
	Cholera Morbus.......	25	18	0	0	20	33	0	20	75	40	38	0	0	0
	Consumption, Pul....	19	21	0	25	20	58	20	0	13	30	13	0	23	25
	Croup, Membranous.	7	6	13	0	0	0	10	0	0	0	0	25	8	33
	Diphtheria...........	63	64	50	75	60	75	80	90	50	40	50	75	69	42
	Diarrhea.............	51	44	13	12	40	42	50	70	75	100	75	63	8	8
	Dysentery............	30	21	0	0	0	17	10	50	50	70	50	25	0	0
	Erysipelas...........	51	30	63	25	60	50	50	20	13	20	25	0	23	8
	Fever, Intermittent.	74	74	63	50	80	75	70	70	63	70	63	100	92	83
	Fever, Remittent....	52	71	38	75	50	42	60	80	63	100	100	88	100	58
	Fev., Typhoid (Ent'c)	23	17	25	13	10	0	0	10	0	20	63	38	31	8
	Fever, Typho-malar'l	27	36	25	38	30	33	40	20	13	30	50	50	38	58
	Influenza............	1	10	0	13	0	33	0	0	0	0	0	0	23	33
	Measles	20	29	13	25	50	75	60	60	25	0	0	0	0	25
	Neuralgia............	45	56	38	38	70	75	70	50	38	60	63	75	54	42
	Pneumonia............	41	49	63	38	50	83	60	40	13	10	13	13	23	75
	Puerperal Fever.....	0	9	0	0	10	25	30	0	0	0	0	13	8	6
	Rheumatism..........	61	59	13	63	90	84	70	70	50	60	38	50	69	33
	Scarlatina	5	21	25	50	10	33	30	20	50	0	13	13	0	25
	Small-pox............	0	6	0	0	0	0	30	30	0	0	13	0	0	0
	Tonsillitis............	68	63	38	50	60	75	100	50	63	50	25	75	62	58
	Whooping cough.....	18	4	13	13	10	8	....	0	0	0	0	0	8	0

Div.*	DISEASES.	1880.	1881.†	Jan.†	Feb.†	Mar.†	Apr.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†
BAY-AND-EASTERN DIVISION.*	Av. for Tab. Diseases Reported Present....	34	39	40	44	45	45	41	44	42	45	47	41	36	35
	Brain, Inflam. of.....	4	6	2	3	6	8	4	2	8	15	8	4	4	2
	Bowels, Inflam. of...	10	19	2	8	23	16	12	26	31	32	26	17	7	17
	Bronchitis	71	76	55	96	91	90	82	61	60	62	60	60	71	73
	Cerebro-spinal Men..	1	12	12	3	6	26	33	19	12	9	0	2	15	13
	Cholera Infantum.....	16	26	0	0	0	9	2	33	73	82	68	23	4	0
	Cholera Morbus.......	19	31	0	10	4	8	9	33	75	66	54	31	18	10
	Consumption, Pul....	61	76	74	76	75	80	80	86	77	69	78	77	78	81
	Croup, Membranous.	7	14	17	22	17	18	12	11	8	3	14	10	16	17
	Diphtheria...........	35	46	43	45	47	43	36	44	55	46	54	71	58	43
	Diarrhea.............	44	62	29	33	48	30	53	79	96	98	86	88	60	37
	Dysentery............	14	12	2	5	2	0	1	42	67	91	62	21	7	6
	Erysipelas...........	21	31	26	33	40	45	33	47	37	26	24	15	15	33
	Fever, Intermittent.	54	87	79	90	91	90	91	88	87	92	93	83	76	79
	Fever, Remittent....	53	49	43	36	34	45	58	61	56	60	64	50	36	35
	Fev., Typhoid (Ent'c)	5	13	2	0	0	0	0	5	6	18	42	40	24	12
	Fever, Typho-malar'l	33	37	14	18	15	5	20	12	25	43	74	81	75	48
	Influenza............	42	29	62	63	66	65	24	35	17	18	28	23	40	44
	Measles	15	29	40	56	57	55	69	56	15	6	14	0	0	2
	Neuralgia............	71	77	83	90	87	90	73	82	65	65	70	69	75	79
	Pneumonia............	46	52	69	78	65	75	60	60	35	36	38	38	42	48
	Puerperal Fever.....	4	7	12	13	17	3	0	2	0	14	8	10	2	4
	Rheumatism..........	75	81	86	66	65	90	64	89	77	71	74	75	76	77
	Scarlatina	14	25	19	53	49	35	36	33	17	20	13	15	11	12
	Small-pox............	0	2	0	0	0	0	0	0	10	0	0	0	0	8
	Tonsillitis............	53	62	83	73	77	65	51	56	39	53	64	65	53	77
	Whooping cough.....	46	19	26	28	26	18	20	14	17	26	26	21	11	8

*, †, ‡. The footnotes to which these marks refer are printed on page 525.

TABLE 2.—CONTINUED.—*Diseases in the Central, the South-Western, the Southern-Central, and the South-Eastern Divisions* of the State, for the Years 1880 and 1881, and by Months† in 1881.—Per Cent of Weekly Reports which Stated Presence of Diseases Named.*[4]

Div.*	DISEASES.	1880.	1881.†	Jan.†	Feb.†	Mar.†	April.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†	Div.*	1880.	1881.†	Jan.†	Feb.†	Mar.†	April.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†
Central Division.*	Av. for Tab. Dis. Rep. Pres.	30	28	30	28	33	30	30	[illegible]	32	36	35	34	34	32	South-Western Division.*	33	32	36	42	42	47	39	35	30	46	42	40	42	35
	Brain, Inflammation of	8	5	2	2	8	2	4	1	12	38	8	2	6	4		2	2	4	4	6	0	0	0	9	7	0	0	0	0
	Bowels, Inflam. of	11	8	9	7	2	4	8	6	12	18	4	4	14	13		6	9	11	11	6	4	0	3	13	17	4	12	15	8
	Bronchitis	53	44	64	61	64	51	43	38	31	25	29	28	52	47		66	57	71	86	91	88	46	34	30	23	43	31	54	61
	Cerebro-spinal Men.	1	8	6	4	0	12	9	3	10	2	8	10	3	6		0.3	0.3	0	0	0	0	0	0	0	0	0	0	0	3
	Cholera Infantum	10	16	0	0	0	0	4	12	43	62	46	27	3	0		7	14	0	4	0	0	0	0	25	67	57	15	0	0
	Cholera Morbus	16	21	4	2	0	4	7	17	57	82	54	[illegible]	7	1		17	23	0	0	0	15	6	17	70	90	70	8	3	11
	Consumption, Pulm'ry	70	63	70	67	70	75	69	61	65	53	52	63	71	63		91	94	100	100	97	100	88	97	100	97	91	100	100	69
	Croup, Membranous	3	4	0	11	0	2	0	0	0	2	4	0	7	10		2	2	0	7	3	0	0	3	4	0	0	0	3	6
	Diphtheria	28	33	36	28	21	29	32	20	25	40	48	51	54	65		21	14	18	21	24	33	8	21	4	3	4	12	3	14
	Diarrhea	43	47	21	15	8	24	27	57	96	97	96	76	80	25		43	54	21	89	42	50	60	49	87	100	100	65	62	31
	Dysentery	16	20	1	2	0	0	0	7	39	65	67	24	10	4		13	24	4	0	6	8	8	21	57	100	70	27	3	0
	Erysipelas	14	14	19	15	17	14	18	13	6	0	10	10	13	29		26	18	21	16	15	4	13	17	17	3	0	35	33	25
	Fever, Intermittent	82	80	[illegible]	57	68	[illegible]	84	88	96	[illegible]	92	86	84	63		89	90	68	79	72	79	79	79	76	90	78	96	91	73
	Fever, Remittent	56	55	49	41	47	55	57	46	49	53	67	76	70	55		75	82	67	68	55	54	33	38	57	47	39	69	58	44
	Fever, Typhoid (enteric)	20	24	32	15	4	2	0	3	20	32	50	47	48	51		7	14	0	11	12	0	4	3	13	17	17	23	24	33
	Fever, Typho-malarial	20	27	13	15	2	2	4	4	18	30	56	73	64	32		24	29	18	11	0	0	8	17	23	27	48	[illegible]	75	33
	Influenza	35	29	61	63	62	47	25	6	2	13	2	6	32	43		62	45	[illegible]	71	58	58	54	24	4	20	13	12	61	58
	Measles	17	30	6	24	45	30	36	64	35	13	5	6	0	3		18	21	14	14	15	33	54	59	30	33	0	18	0	0
	Neuralgia	52	48	36	50	47	47	43	51	43	33	[illegible]	51	69	49		72	89	93	93	94	88	83	79	78	70	78	65	[illegible]	76
	Pneumonia	39	38	56	72	60	69	46	17	18	5	3	20	42	56		37	35	61	75	64	58	38	7	0	23	13	6	18	33
	Puerperal Fever	4	3	0	4	0	4	0	1	6	0	6	2	4	1		1	2	4	0	0	0	0	0	0	0	4	0	0	11
	Rheumatism	60	[illegible]	53	59	62	67	63	46	57	58	52	67	70	72		80	93	89	98	[illegible]	96	96	100	87	97	91	92	97	83
	Scarlatina	16	11	28	11	9	14	2	0	12	7	8	12	20	18		15	9	7	14	15	4	6	24	12	0	9	0	0	8
	Small-pox	0	0.8	0	0	0	4	0	0	0	0	0	0	0	0		0	1	4	0	0	0	0	0	0	0	0	0	9	3

Division	Disease															Division														
	Tonsillitis	43	34	53	57	51	39	16	26	14	18	19	53	46	49		42	30	61	67	70	58	29	28	22	13	4	27	30	58
	Whooping Cough	31	5	11	4	9	6	5	1	8	2	0	0	4	7		35	15	11	4	9	13	13	10	17	20	17	15	15	31
Southern-Central Division.*	Av. fo Tot. Dis. Rep. Pres	29	31	34	36	37	34	30	27	31	35	38	36	31	31	South-Eastern Division.*	36	35	44	40	36	42	37	34	38	38	39	39	37	32
	Brain, Inflammation of	3	3	2	7	3	3	1	0	4	4	4	0	1	2		17	13	11	11	15	22	18	18	11	13	13	14	12	9
	Bowels, Inflam. of	9	13	14	12	16	4	8	13	21	24	12	12	6	14		27	16	8	26	18	13	13	18	19	20	13	14	17	11
	Bronchitis	71	69	92	94	89	87	70	* 49	38	44	55	57	75	80		67	60	100	97	93	84	53	45	26	18	19	32	71	65
	Cerebro-spi. Men	4	9	0	3	4	16	16	11	8	13	10	11	5	7		1	13	0	0	15	31	38	15	11	13	13	14	19	5
	Cholera Infantum	11	14	0	1	0	0	3	7	42	61	36	12	5	0		19	18	0	0	3	0	0	25	53	65	58	11	0	2
	Cholera Morbus	18	20	6	15	8	9	10	24	86	69	69	29	8	2		26	29	3	6	8	9	28	43	72	85	55	29	7	5
	Consumption, Pulm'ry	64	65	66	72	79	70	62	49	51	60	66	71	69	65		90	96	100	100	100	100	100	100	94	100	100	100	95	73
	Croup, Membranous	5	8	14	22	18	9	1	3	3	2	0	3	10	5		14	16	31	22	19	13	16	6	11	13	12	14	20	16
	Diphtheria	14	22	16	28	27	19	20	11	19	14	16	25	36	30		34	32	47	53	23	28	25	16	19	20	29	39	39	50
	Diarrhea	41	49	30	40	34	23	17	41	86	93	93	72	34	34		55	51	19	28	35	44	41	63	92	68	61	64	44	25
	Dysentery	14	18	8	0	1	1	3	3	46	71	56	34	6	1		26	23	0	3	6	0	0	20	63	70	71	43	17	0
	Erysipelas	26	21	35	33	27	19	11	15	11	19	16	15	23	24		35	28	39	28	48	38	13	26	17	18	13	32	34	30
	Fever, Intermittent	87	85	77	72	73	84	93	98	97	99	100	98	80	63		83	82	61	58	55	75	97	100	100	100	97	96	85	66
	Fever, Remittent	54	59	52	43	47	57	63	67	65	67	79	71	62	54		56	42	31	25	25	50	41	40	47	63	66	68	44	20
	Fever, Typhoid (enteric)	5	9	3	4	4	1	6	0	3	8	16	20	24	19		32	28	31	17	13	13	13	13	17	33	45	68	39	41
	Fever, Typho malarial	16	24	22	24	32	10	4	1	3	13	46	58	51	33		30	29	14	10	0	0	13	18	51	30	58	71	61	36
	Influenza	36	29	47	55	57	47	24	13	4	9	16	18	20	38		51	39	33	30	68	59	28	15	14	18	16	14	30	27
	Measles	18	22	5	37	45	63	59	28	16	13	0	0	2	2		30	18	0	3	45	56	34	16	19	20	18	14	2	0
	Neuralgia	61	67	73	83	74	76	63	59	47	64	57	55	75	72		56	53	67	69	65	68	63	60	50	33	35	36	56	48
	Pneumonia	38	34	77	75	62	60	44	15	8	2	13	6	24	30		48	45	58	72	48	44	47	35	25	20	29	39	39	61
	Puerperal Fever	3	2	2	4	1	1	1	1	1	4	3	0	0	9		8	11	0	3	10	3	3	10	17	15	13	29	17	9
	Rheumatism	72	72	70	67	85	88	76	70	61	66	63	66	79	78		76	69	69	75	73	84	75	78	64	68	61	69	76	55
	Scarlatina	11	15	23	25	27	29	30	9	4	7	1	6	7	16		23	28	19	42	28	44	31	23	19	25	26	29	24	25
	Small-pox	1	1	3	1	0	1	0	0	0	0	0	0	2	6		0.4	11	0	0	8	25	47	25	11	10	0	0	2	9
	Tonsillitis	45	47	64	72	67	71	41	32	21	9	21	35	59	63		48	42	58	64	63	47	38	40	31	13	23	14	42	61
	Whooping-cough	18	17	16	15	9	7	18	10	15	16	26	18	30	23		44	25	31	17	13	19	22	36	53	28	16	14	22	23

*,†,‡. The footnotes to which these marks refer are given on page 525.

EXHIBIT 36.—*By Months and by Geographical Divisions of the State, the Names of 116 Observers whose Weekly Reports of Diseases for 1881 are Compiled in Tables 1, 2, 3, and 4, the Localities* for which they Report, and the Number of Reports received from each Observer.*

DIVISIONS AND LOCALITIES REPRESENTED, AND PHYSICIANS WHO REPORTED. (Health Officers in italics; those also Correspondents marked with a *.)	WEEKLY REPORTS IN 1881.—COMPILED ON PAGES 524-33. Year 1881.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct	Nov.	Dec.
ALL LOCALITIES	3,567	276	277	335	267	274	337	276	329	255	254	337	350
UPPER PENINSULAR DIVISION. †	*60*	*8*	*8*	*6*	*4*	*4*	*5*	*4*	*6*	*4*	*4*	*6*	*4*
Houghton, H W Jones, M D.	52	4	4	5	4	4	5	4	6	4	4	5	4
Marquette, B. S Taft, M. D.	8	4	4	----	----	----	----	----	----	----	----	----	----
NORTHWESTERN DIVISION. †	*68*	*7*	*8*	*10*	*8*	[illegible]	*5*	*4*	*5*	*4*	*4*	*5*	*4*
Cadillac, *John Leeson, M D.*	16	3	4	5	4	----	----	----	----	----	----	----	----
Manistee, *Geo La Montagne*	52	4	4	5	4	4	5	4	5	4	4	5	4
NORTHEASTERN DIVISION. †	*38*	*4*	*4*	*5*	*4*	*4*	*5*	*3*	*5*	*4*	----	----	----
Alcona, G. A. Stockwell, M. D.	38	4	4	5	4	4	5	3	5	4	----	----	----
WESTERN DIVISION †	*319*	*33*	*32*	*33*	*24*	*24*	*30*	*23*	*24*	*16*	*20*	*28*	*26*
Cedar Springs, C S. Ford, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Drenthe, Henry Kremers, M. D.	40	4	4	5	4	4	5	3	----	----	4	5	2
Grand Haven, *A Vander Veen,* M.D.*	34	4	4	5	4	4	5	4	4	----	----	----	----
Grand Rapids, A. Hazlewood, M. D.	50	4	4	3	4	4	5	4	5	4	4	5	4
Grand Rapids, *W. B Morrison, M. D.*	8	4	4	----	----	----	----	----	----	----	----	----	----
Lowell, *O. C McDannell, M D*	7	----	----	----	----	----	----	----	----	----	----	3	4
Ludington, *A. P McConnell, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Muskegon John P Stoddard, M. D	13	4	4	5	----	----	----	----	----	----	----	----	----
Muskegon, *O. C. Williams, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Rockford, *D W. C. Burch,* M D.*	4	----	----	----	----	----	----	----	----	----	----	----	4
NORTHERN-CENTRAL DIVISION †	*117*	*8*	*8*	*20*	*12*	*10*	*10*	*8*	*10*	*8*	*8*	*13*	*12*
Big Rapids, *L. W. Badger, M D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Mt. Pleasant, *L J. King, M. D*	7	----	----	----	----	----	----	----	----	----	----	3	4
Roscommon, W S. Washington, M D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Stanwood, J. I Northrup, M. D.	6	----	----	----	4	2	----	----	----	----	----	----	----
BAY AND EASTERN DIVISION †	*593*	*42*	*40*	*47*	*40*	*45*	*57*	*52*	*66*	*50*	*48*	*55*	*52*
Bay City, W. R Marsh, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Bay City, *J R Thomas, M D.*	4	----	----	----	----	----	----	----	----	----	----	----	4
Brockway, A Mitchell, M. D.	35	----	----	----	----	4	5	4	5	4	4	5	4
East Saginaw, *B L. Cleveland, M D.*	50	2	4	5	4	4	5	4	5	4	4	5	4
Lapeer, *Hugh McColl,* M D*	40	4	4	4	4	4	5	4	5	2	----	----	4
Lexington, *A. W. Oldfield,* M. D.*	51	4	4	4	4	4	5	4	5	4	4	5	[illegible]
Port Huron, *Jas. K Farnum, M. D.*	17	4	4	5	4	----	----	----	----	----	----	----	----
Port Huron, *Myron Northup,* M.D.*	24	----	----	----	----	2	5	4	5	4	4	----	----
Port Huron, A. A. Whitney, M D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Port Sanilac, J M Loop, M. D.	4	4	----	----	----	----	----	----	----	----	----	----	----
Saginaw City, N D. Lee, M D.	50	4	4	5	4	3	4	4	5	4	4	5	4
Saginaw City, *I. N Smith, M. D*	52	4	4	5	4	4	5	4	5	4	4	5	4
St Clair, *W H Smith,* M. D.*	33	----	----	----	----	4	3	4	5	4	4	5	4
Thornville, John S Caulkins, M D.	51	4	4	4	4	4	5	4	5	4	4	5	4
West Bay City, *A F. Hagadorn, M D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
West Bay City, J. W. Hauxhurst, M.D.	26	----	----	----	----	----	----	4	5	4	4	5	4
CENTRAL DIVISION †	*667*	*47*	*46*	*59*	*49*	*56*	*69*	*51*	*60*	*48*	*51*	*69*	*68*
Charlotte, *W. H Rand, M. D.*	4	----	----	----	----	----	----	4	----	----	----	----	----
Corunna, *Almon G Bruce, M D.*	38	----	----	----	3	4	5	4	5	4	4	5	4
Dansville, *C C Sherman, M. D.*	4	----	----	----	----	----	----	----	----	----	----	----	4
De Witt, G. W Topping, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Elsie, E. V Chase, M D	52	4	4	5	4	4	5	4	5	4	4	5	4
Flint, *H. C Burbank,* M D*	46	3	4	5	4	4	4	4	5	4	4	5	----
Flint, *G W. Howland, M D.*	4	----	----	----	----	----	----	----	----	----	----	----	4
Greenville, C S Sheldon, M. D	8	----	----	----	----	----	----	----	----	----	----	4	4
Hastings, *I Dever, M D.*	14	----	----	----	----	----	5	----	5	4	----	----	----
Hastings, A P Drake, M D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Hastings, *J. C. Lampman, M. D.*	14	4	2	----	4	4	----	----	----	----	----	----	----
Ionia (B of C), W F. Reed, M D	29	4	4	5	4	4	5	3	----	----	----	----	----
Ionia, *S F. Romig, M D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Ithaca, *C W Marvin, M. D.*	4	----	----	----	----	----	----	----	----	----	----	----	4
Lansing, *J H. Wellings, M D.*	52	4	4	5		4	5	4	5	4	4	5	4

* Health officers of cities are supposed to report for their cities only; the reports of other observers are not thus restricted in locality, but in many cases include the vicinity as well as the corporate limits of the place named.

* Health Officer and Correspondent.

† For counties in each division, see Exhibit 1, page 237.

EXHIBIT 36.—CONTINUED.

DIVISIONS AND LOCALITIES REPRESENTED, AND PHYSICIANS WHO REPORTED. (Health Officers in italics; those also Correspondents marked with a *.)	Weekly Reports in 1881.—Compiled on Pages 524-33.												
	Year 1881.	Jan.	Feb.	Mar.	Apr.	May.	June.	July	Aug.	Sept.	Oct.	Nov.	Dec.
CENTRAL DIVISION †—*Continued:*													
Lyons, *B. M. Hutchinson, M. D.*	4												4
Mason, *W. W. Root,* M. D.*	13										4	5	4
Muir, *L. S. Stevens,* M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Otisville,* A. W. Nicholson, M. D.	25	4	4	5	4	4	4						
Otisville, O. A. Wisner, M. D.	27						1	4	5	4	4	5	4
Ovid, *O. B. Campbell,* M. D.*	28	4	4	3		4	5				3	5	
Pierson, *James Tollen, M. D.*	4												4
Webberville, R. B. Smith, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Woods Corners, Geo. Pray, M. D.	37				2	4	5	4	5	4	4	5	4
SOUTHWESTERN DIVISION †	*337*	*28*	*26*	*33*	*24*	*24*	*29*	*29*	*30*	*23*	*26*	*33*	*36*
Bangor, *J. Camp, M. D.*	4												4
Mattawan, Thos. H. Briggs, M. D.	41	4	4	4	4	4	4	3	5	3	3	3	
Niles, Simeon Belknap, M. D.	12	4	4	4									
Niles, *O. P. Horn, M. D.*	35					4	5	4	5	4	4	5	4
Niles, James S. Reeves, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Niles, *Irvin Simpson, M. D.*	29	4	4	5	4						3	5	4
Otsego, *Milton Chase,* M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Paw Paw, Josiah Andrews, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
St. Joseph, *R. W. Stratton,* M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
South Haven, *G. V. Hilton, M. D.*	4												4
Wayland, *E. H. Rynd, M. D.*	4												4
SOUTHERN-CENTRAL DIVISION †	*929*	*64*	*67*	*89*	*70*	*71*	*87*	*72*	*86*	*67*	*65*	*88*	*104*
Adrian, Robt. Stephenson, M. D.	42	4	4	5	4	4	5	4	5	4	3		
Albion, *W. W. Collins, M. D.*	4												4
Albion, Amos Crosby, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Blissfield, R. B. O. Newcomb, M. D.	17	4	4	5	4								
Brooklyn, E. N. Palmer, M. D.	50	4	4	5	2	4	5	4	5	4	4	5	4
Burr Oak, *C. D. Parsons, M. D.*	4												4
Clinton, A. W. Alvord, M. D.	47		3	5	4	4	5	4	5	4	4	5	4
Coldwater, *L. A. Waredo, M. D.*	13	4	4	5									
Coldwater, *L. H. Wurtz,* M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Grass Lake, *E. B. Chapin, M. D.*	4												4
Hillsdale, *John W. Pulley,* M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Hudson, *G. W. Rice, M. D.*	4												4
Hudson, A. R. Smart, M. D.	47	4	4	5	4	3	4	4	3	3	4	5	4
Jackson (Prison), E. L. Kimball, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Jackson, W. Worsfold, M. D.	44			5	4	4	5	4	5	4	4	5	4
Kalamazoo, W. B. Southard, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Manchester, A. C. Taylor, M. D.	22					4	4	4	4	2			4
Marshall, *L. E. Gallup, M. D.*	9											5	4
Marshall, H. L. Joy, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Marshall, *Jas. F. Souley, M. D.*	23				4	4	4	4	3	2	2		
Mendon, H. C. Clapp, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Mendon, Edwin Stewart, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Morenci, C. T. Bennett, M. D.	7											3	4
Parma, *N. J. De Puy, M. D.*	4												4
Quincy, *H. A. King, M. D.*	4												4
Tecumseh, L. G. North, M. D.	9											5	4
Teconsha, *W. W. Stelter, M. D.*	4												4
Three Rivers, *O. W. Backus,* M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Union City, *Nelson H. Claflin, M. D.**	12	4	4	4									
Union City, R. P. Beebe, M. D.	39				4	4	5	4	5	4	4	5	4
Ypsilanti, *Edward Batwell,* M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
SOUTHEASTERN DIVISION †	*436*	*36*	*36*	*40*	*32*	*32*	*40*	*36*	*40*	*31*	*28*	*47*	*44*
Armada, *C. H. Lincoln, M. D.*	4												4
Detroit (Eastern District), Judson Bradley, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Detroit, W. H. Rouse, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Dundee, *J. W. Mason, M. D.*	4												4
Milford, *C. G. Davis, M. D.*	7											3	4
Milford, *Robert Johnston, M. D.**	52	4	4	5	4	4	5	4	5	4	4	5	4
Monroe, *A. I. Sawyer, M. D.*	8	4	4										
Monroe, *I. E. Brown, M. D.*	4							4					
Northville, *James Heuston, M. D.*	3											3	
Northville, *J. M. Swift,* M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Petersburgh, *S. L. Jones, M. D.*	4												4
Pontiac, *W. G. Elliott,**	52	4	4	5	4	4	5	4	5	4	4	5	4
Utica, G. G. Roberson, M. D.	39	4	4	5	4	4	5	4	5	3			
Washington, Albert Yates, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Wyandotte, E. P. Christian, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4

*Health Officer and Correspondent. † For counties in each division, see Exhibit 1, page 297

TABLE 4.—*A Summary for the Year 1881, relative to Diseases in each of the Six Divisions of the State from which the most Weekly Reports were received,—indicating the prevalence as regards both Time and Area.*

DISEASES.	Western Div.*				Bay and Eastern.*				Central Div.*				S. Western Div.*				S. Central Div.*				S. Eastern Div.*			
	Per Cent of Observers Reporting Presence of b	Average Per Cent of Weeks Reported Present where Present c	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence where Present e	Per Cent of Observers Reporting Presence of b	Average Per Cent of Weeks Reported Present where Present c	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence where Present e	Per Cent of Observers Reporting Presence of b	Average Per Cent of Weeks Reported Present where Present c	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence where Present e	Per Cent of Observers Reporting Presence of b	Average Per Cent of Weeks Reported Present where Present c	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence where Present e	Per Cent of Observers Reporting Presence of b	Average Per Cent of Weeks Reported Present where Present c	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence where Present e	Per Cent of Observers Reporting Presence of b	Average Per Cent of Weeks Reported Present where Present c	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence where Present e
Av. for Tabulated Diseases Reported Present	51	79	41	6.5	53	75	39	5.5	40	71	28	4.3	43	74	32	4.0	42	74	21	4.2	45	78	35	5.6
Brain, Inflammation of	12	58	7	17.7	18	30	6	10.6	11	43	5	6.4	10	22	2	6.0	7	36	3	5.4	14	93	13	11.9
Bowels, Inflammation of	23	67	15	14.0	37	52	19	7.6	19	42	8	6.7	28	33	9	6.0	25	53	13	5.3	22	75	16	11.6
Bronchitis	76	86	65	4.9	82	92	76	4.6	69	75	44	4.1	75	76	57	3.4	79	88	69	3.4	78	83	60	3.9
Cerebro-spinal Meningitis	23	44	10	11.6	23	53	12	8.4	17	38	6	6.3	1	25	0.3	3.0	14	62	7	5.2	17	76	13	12.5
Cholera Infantum	35	65	24	7.5	37	69	26	5.6	23	68	16	4.9	20	70	14	3.0	23	60	14	4.5	26	66	18	5.8
Cholera Morbus	49	64	29	7.3	47	63	31	6.5	35	58	21	4.3	40	56	23	4.7	43	67	29	4.0	43	64	28	5.4
Consumption, Pulmonary	70	94	66	8.8	83	92	76	5.9	72	90	65	5.4	99	96	94	4.6	71	90	65	5.2	97	99	96	5.8
Croup, Membranous	23	53	13	12.5	29	46	14	7.7	11	38	4	6.4	9	30	2	5.4	16	46	5	6.1	22	73	10	12.9
Diphtheria	77	80	62	6.0	66	72	48	6.2	58	66	36	4.6	29	49	14	3.0	40	55	22	5.2	47	69	32	6.1
Diarrhea	73	78	55	5.5	76	81	62	3.9	62	77	47	3.6	66	80	55	3.5	64	78	48	3.3	67	76	51	4.9
Dysentery	36	86	32	7.2	48	67	32	5.3	51	62	20	4.7	38	62	24	4.5	27	66	18	4.5	34	65	23	6.0
Erysipelas	51	67	34	7.7	54	57	31	7.1	31	46	14	5.4	41	46	13	6.0	39	53	21	5.4	42	66	29	7.3
Fever, Intermittent	96	93	90	1.9	90	96	87	1.7	88	91	80	2.5	91	87	80	2.9	93	91	85	2.5	91	90	82	3.0
Fever, Remittent	86	88	75	3.4	64	76	49	4.5	67	82	55	3.1	64	82	52	3.3	69	85	60	3.3	51	82	42	3.7
Fever, Typhoid (enteric)	24	83	21	11.6	22	59	13	5.5	36	69	24	5.4	21	66	14	5.9	16	68	9	5.1	34	82	28	7.4
Fever, Typho malarial	51	76	45	7.7	55	67	37	5.5	36	74	27	4.1	45	64	29	4.7	36	67	24	5.2	39	74	29	4.1
Influenza	55	82	45	4.3	56	69	39	4.5	41	70	29	2.9	53	75	43	2.6	39	76	29	3.0	51	77	39	3.8
Measles	36	66	25	6.5	41	69	29	5.3	40	76	30	3.1	30	69	21	2.6	30	71	22	3.4	27	64	18	8.8
Neuralgia	83	90	79	4.3	84	91	77	4.6	63	77	45	4.2	93	98	84	4.0	81	83	67	4.1	67	79	53	4.8
Pneumonia	74	91	60	5.9	72	73	52	6.3	59	65	56	4.4	50	70	35	4.8	52	65	34	4.7	61	76	45	6.0
Puerperal Fever	22	58	13	12.1	17	39	4	8.0	9	36	3	7.1	8	25	2	3.2	7	37	2	5.8	13	59	11	11.3
Rheumatism	81	86	69	5.6	89	91	81	5.4	78	79	60	4.4	99	94	93	4.1	90	80	73	4.2	77	89	69	4.4
Scarlatina	50	70	33	8.3	43	67	25	7.1	24	47	11	5.9	19	46	9	4.6	29	58	15	5.7	36	75	28	8.1
Small-pox	3	33	1	6.5	5	56	2	7.8	1	25	0.3	0.9	4	23	1	4.0	4	36	1	5.5	15	74	11	13.8
Tonsillitis	76	84	66	5.5	78	80	62	5.8	52	65	34	4.0	50	67	30	3.5	66	73	47	4.1	61	70	47	4.3
Whooping-cough	30	66	20	6.7	29	60	19	7.8	9	55	5	4.7	24	61	15	3.6	25	68	17	4.9	80	80	65	9.8

* For counties in each division see Exhibit 1, page [illegible] b, c, d, e, See foot-notes with these marks on page [illegible].

WHAT DISEASES CAUSE MOST SICKNESS.

Exhibit 37, page 538, is an attempt to present the evidence of the weekly reports, as to what diseases caused most sickness in Michigan in 1881. Intermittent fever, rheumatism, bronchitis, neuralgia, and remittent fever (naming them in order of greatest prevalence) seem to be the five diseases from which there was most sickness in that year, as shown by the proportion of reports on which these diseases were reported present, and by their average order of prevalence when reported present. This exhibit also states for each of the years 1880 and 1879 what diseases appear to have caused most sickness in those years, the apparent order of prevalence of the diseases being denoted by numbers in the columns headed "Order" for those years.

The question, What diseases cause most sickness, is quite different from the question, What diseases cause most deaths. Thus the diseases causing most sickness in 1880 seem to have been: 1. Intermittent fever; 2. Bronchitis; 3. Remittent fever; 4. Rheumatism; 5. Neuralgia; while according to returns to the State Department, the diseases which caused most deaths in 1880 were: 1. Consumption (1,829 deaths); 2. Diphtheria (1,542 deaths); 3. Pneumonia (812 deaths); 4. Still-born (738 deaths); 5. Old age (625 deaths).

It should be distinctly understood that this entire article on "Weekly Reports of Diseases" relates to sickness, and not to deaths, except incidentally, as in the paragraph preceding this; and in all such exceptional cases the fact that deaths are under consideration is distinctly stated.

What diseases are supposed to have caused most sickness in 1881 in each of the six divisions of the State from which the most reports were received (and which are also the most thickly settled parts of the State), is stated in Exhibit 38, page 539. It should be noticed that the greater the number of diseases which an observer reports present, the larger numbers, as a rule, will be required to denote their order of prevalence. Hence for divisions of the State where the observers report a large number of diseases present (as at Muskegon in the Western Division, or Detroit in the Southeastern Division), large numbers will be found in the "order of prevalence" columns in Table 4, page 536, and Table 3 (a table omitted in this Report, but one from which Tables 1, 2, and 4 have been compiled. Table 3 for 1880 is printed on pages 326-75 of the Report for 1881). In comparing the average order of prevalence of diseases tabulated in Table 2, for the State, pages 524-9, with similar statements for previous years, pages 314-5 of the Report of 1881, pages 374-5 of the Report for 1880, pages 404-5 of the Report for 1879, etc., it will be seen that the addition of neuralgia, tonsilitis, inflammation of brain, and inflammation of bowels to the printed blanks has increased the average of numbers denoting order of prevalence.

EXHIBIT 37.—*Diseases from which there seems to have been the Most Sickness in Michigan in 1881, as indicated by the Per Cent of Weekly Reports Stating Presence of the Diseases, as studied in connection with the Average Order of Prevalence of said Diseases when reported present; also, Order, Per Cent of Reports, and Average Order for the Same Diseases in 1880 and 1879.*

	1881.				1880.			1879.		
Order *	Diseases in Order of Apparent Sickness in 1881, Most Prevalent One First.	Per Cent of Reports Stating Pres'nce of. d	Av. Order of Prevalence when Present. e	Order.*	Per Cent of Reports Stating Pres'nce of. d	Av. Order of Prevalence when Present. e	Order.*	Per Cent [illegible] Reports Stating Pres'nce of. d	Av. Order of Prevalence when Present. e
More Sickness than average for 26 diseases, in 1881. 1	Intermittent Fever	82	2.4	1	82	2.3	1	88	2.2
2	Rheumatism	71	4.6	4	71	4.6	3	73	4.6
3	Bronchitis	62	3.9	2	64	3.7	2	64	3.6
4	Neuralgia	65	4.3	5	64	4.5	6	60	4.5
5	Remittent Fever	54	3.5	3	56	[illegible]	4	57	3.3
6	Diarrhea	53	3.9	7	47	4.2	8	48	4.4
7	Consumption, Pulmonary	71	5.6	8	68	5.7	5	70	5.6
8	Tonsilitis	48	4.5	9	49	4.4	9	45	4.5
9	Influenza	35	3.5	6	42	3.0	7	46	3.1
10	Pneumonia	41	[illegible]	10	42	5 1	10	[illegible]	5.3
(11)	Average of 26 diseases	33	4.9	(11)	32	4.7	(11)	33	4.7
Less than said average. 11	Measles	36	4.4	12	19	4.6	14	12	4.7
12	Diphtheria	34	5.6	13	27	5.7	11	29	5.4
13	Typho-malarial Fever	29	5.2	15	[illegible]	5.5	15	22	5.8
14	Cholera Morbus	26	5.3	14	20	5.3	13	19	5.3
15	Dysentery	23	5.1	16	18	5.8	19	18	6.2

* Judging from the per cent of reports which stated presence of the diseases, in connection with the order of prevalence when prevalent.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State. It combines and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence.

e The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals of the Order of Prevalence columns, in Table 3 (omitted in this Report), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the order of prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa;* but the greater the number of diseases reported present by each observer, from week to week, the greater will be the "average" in this column.

EXHIBIT 38.—*By Six (of eleven) Geographical Divisions* of the State, the Diseases from which there seems to have been the Greatest Amount of Sickness in 1881, as indicated by the Per Cent of Weekly Reports Stating Presence of Each of 26 Leading Diseases, when studied in connection with the Average Order of Prevalence of said Diseases when reported present.*

Order.†		Diseases in Order of Apparent Amount of Sickness, Most Prevalent one First.	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence where Present.e	Diseases in Order of Apparent Amount of Sickness, Most Prevalent one First	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence where Present.e	Diseases in Order of Apparent Amount of Sickness, Most Prevalent one First.	Per Cent of Reports Stating Presence of d	Av. Order of Prevalence where Present.e
		Western Division.*			Bay and Eastern Div.*			Central Division.*		
More sickness than av. for 26 diseases.	1	Intermittent Fever	90	1.9	Intermittent Fever	87	1.7	Intermittent Fever	80	2.5
	2	Remittent Fever...	78	3.4	Bronchitis..........	76	4.6	Remittent Fever...	55	3.1
	3	Neuralgia	79	4.3	Neuralgia	77	4.9	Rheumatism...... ..	69	4.4
	4	Rheumatism........	69	5.6	Rheumatism........	81	5.4	Diarrhea............	47	3.6
	5	Bronchitis..........	63	4.9	Diarrhea...........	65	3.9	Influenza..........	29	2.9
	6	Tonsilitis...........	66	5.5	Consumption, Pul..	76	6.9	Neuralgia	48	4.3
	7	Diarrhea............	55	5.6	Tonsilitis	63	5.8	Measles.............	30	3.1
	8	Pneumonia..........	60	6.9	Remittent Fever...	49	4.8	Bronchitis..........	44	4.1
	9	Influenza...........	45	4.3	Influenza.....	39	4.6	Consumption, Pul..	65	5.4
	10	Diphtheria	62	6.0	Pneumonia	52	6.3	Tonsilitis...........	34	4.0
	11	Consumption, Pul..	66	8.6	Diphtheria	48	6.2	Pneumonia	58	4.4
		Av. of 26 diseases.	41	6.5	Av. of 26 diseases.	39	5.5	....	....	....
Less.	12	Typho-malarial F ..	43	7.7	Typho-malarial F..	37	5.5	Diphtheria	38	4.5
	13	Dysentery.	22	7.2	Dysentery...........	32	5.3	Typho-malarial F .	27	4.1
	14	Cholera Morbus...	32	7.3	Measles	39	5.3	Av. of 26 diseases.	28	4.3
		South-western Div.*			South's Central Div.*			South-Eastern Div.*		
More sickness than av. for 26 diseases.	1	Intermittent Fever	60	2.9	Intermittent Fever	85	2.5	Intermittent Fever	82	3.0
	2	Rheumatism.......	53	4.1	Bronchitis..........	69	3.4	Consumption, Pul..	96	5.3
	3	Neuralgia	53	4.0	Remittent Fever...	50	3.3	Bronchitis..........	60	3.2
	4	Influenza....	45	2.6	Rheumatism.......	72	4.2	Rheumatism...... ..	69	4.4
	5	Consumption, Pul..	94	4.6	Neuralgia...........	67	4.1	Neuralgia	53	4.8
	6	Bronchitis..	67	3.4	Diarrhea............	49	3.3	Remittent Fever...	42	3.7
	7	Remittent Fever...	52	3.3	Influenza	29	3.0	Diarrhea...........	51	4.9
	8	Diarrhea............	55	3.5	Tonsilitis..........	47	4.1	Influenza	39	3.8
	9	Measles............	21	2.8	Consumption, Pul .	65	5.2	Tonsilitis..........	42	4.3
	10	Tonsilitis...........	39	3.5	Measles............	22	3.4	Pneumonia	45	6.0
		Cholera Infantum .	14	3.0	Cholera Morbus....	29	4.0	Typho-malarial F .	20	4.1
		Av. of 26 diseases.	32	4.0	Av. of 26 diseases.	31	4.2	Av. of 26 diseases.	35	5.3
Less.	12	Whooping cough...	15	3.6	Pneumonia	31	4.7	Cholera Morbus....	28	3.4
	13	Diphtheria..........	14	3.9	Dysentery	18	4.3	Diphtheria	32	6.1

* For counties in each division see Exhibit 1, page 287.

† Judging from the per cent of reports in connection with the "average order of prevalence where present."

d, e. See foot-notes with these marks on page 538.

CLIMATE AND SICKNESS.*

Exhibit 39* is an attempt to learn something of relations of bronchitis to meteorological conditions, by noting whether each condition was greater or less than its average for the year, in months when more and in months when less bronchitis than the average for the year was reported. The months are arranged in order according to the amount of bronchitis reported, those in which most bronchitis was reported being placed at the top of the column, and those in which more bronchitis than the average was reported being placed above the average line, the others below that line. The conditions for each month are printed, in the proper columns, in the line for the month. The statements being thus arranged it is easy to see whether the temperature, the velocity of the wind, or any other condition, was above its average for the year in months when more than the average amount of bronchitis was reported, and in months when less bronchitis was reported. That the comparisons may the more readily be held in mind propositions have been made concerning the relations of bronchitis to meteorological conditions (stated on pages 540–2), grouping the conditions into two classes. The letters *a* and *b*, in the exhibit, mark exceptions to these propositions. It is not supposed that the propositions are in every case true; but they serve to bring out the evidence of the exhibit on the subject in question. This evidence is to be had by noting the number and force of the exceptions to the proposition, and also whether the exception is explained by facts shown in other columns. A summary of the evidence is presented in Exhibit 73, near the close of this article.

Similar exhibits, relating to other diseases, are given on following pages. To prevent confusion it has been thought best not to change the statement of the propositions to fit the evidence concerning the several diseases,—except that they are differently stated for the summer diseases (beginning with the exhibit on diarrhea) and for the winter diseases (beginning with that on bronchitis),—a somewhat arbitrary classification of the diseases treated, but one useful for the present purpose.

RELATIONS OF BRONCHITIS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.†—That **more** than the average per cent of weekly reports stated the presence of Bronchitis in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of reports stated the presence of Bronchitis in the months when these conditions were **less** than the average for the year. In Exhibit 39, page 541, the letter *a* marks exceptions to this proposition for the year 1881.

PROPOSITION 2.†—That more than the average per cent of weekly reports stated the presence of Bronchitis in months when the average daily temperature, and the absolute humidity of the atmosphere were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of Bronchitis in months when these conditions were greater than the average for the year.

By Exhibit 39, page 541, it may be seen that there is for 1881 no exception to Proposition 2, relating to Bronchitis.

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* The remarks under this head are applicable also, by changing the name of the disease, to Exhibits 41, 43, 45, etc, on following pages. Exhibit 39 is on page 541.
† Explanations are given above; and a summary in Exhibit 73, close of this article.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 2, it is true also that the quantity of vapor inhaled daily was **less** than the average, and the quantity

EXHIBIT 39.—BRONCHITIS.—*Stating, for the Year and for each Month of the Year 1881, what Per Cent of the Weekly Reports of Diseases Stated Presence of Bronchitis, and what were the Meteorological Conditions as observed at the Office of the State Board of Health, Lansing, Michigan, which is near the Center of the thickly-settled part of the State.**—(*See Propositions 1, 2, and 3, pages 440–2.*)

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Bronchitis.†	Per Cent of Weekly Reports Stating Presence of Bronchitis.†	Av. Order of Prevalence where Present †, ‡	Temperature, Degrees, F.		Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily.		Vapor Inhaled and Exhaled. (Oz., Troy.)		Av. Per Cent of Cloudiness.	Ozone,—Relative. Scale of 10 Degrees of Coloration.		Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury. (Reduced to 32° F.)		
			Av. Daily Range, by Registering Thermometers,—Observed at 7 A. M.	Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Relative Per Ct. of Saturation.	Absolute—Grs. of Vapor in a Cu. Ft. of Air	Vapor Inhaled by one person in 24 Hours.‖	Vapor Exhaled from Air Passages in 24 H., in Excess of that Inh'd.¶		Day Observation,—7 A. M. to 2 P. M.	Night Observation,—9 P. M. to 7 A. M.		Range. Monthly, and for Year.	Range. Av. Daily, by Obsvns. at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
YEAR 1881.	62	3.9	††112	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	.186	29.017
More than the Av. Per Cent of Bronchitis. Feb.	86	3.0	a19.61	22.27	80	1.40	.88	10.80	68	a 3.75	5.54	11.0	1.336	.302	29.071
Jan.	80	2.9	a18.66	16.98	81	1.06	.68	11.00	65	4.52	5.45	a 7.3	1.202	.248	29.077
Mar.	80	3.1	a14.68	30.59	78	1.76	1.10	10.56	62	4.52	6.00	10.4	1.017	.214	a28.931
April	78	3.8	21.88	43.22	a 64	2.49	1.56	10.12	a 46	4.60	6.07	9.8	a .717	a .149	a28.978
Dec.	69	3.1	a12.55	35.29	75	2.10	1.31	10.37	62	a 3.39	a 3.77	11.2	.947	.215	29.066
Nov.	66	3.6	a15.57	38.78	74	2.37	1.48	10.20	67	a 3.87	5.30	14.6	1.069	.279	29.037
Average...	62	3.9	19.84	c 49.59	70	c 3.54	2.21	9.47	54	4.00	4.66	9.6	.845	.186	29.017
Less than the Av. Per Cent of Bronchitis. May.	62	3.8	a24.10	56.94	61	4.84	3.03	8.66	52	3.94	4.26	8.4	.707	.116	a29.039
June	53	4.3	a21.43	65.99	67	5.07	3.17	8.51	a 58	3.73	a 4.80	8.4	.541	.154	28.940
Oct.	44	4.8	19.54	53.68	a 75	3.94	2.46	9.22	a 65	2.77	[illegible]	8.7	928	a .206	a29.089
Sept.	44	6.3	a22.53	71.33	65	5.59	3.49	8.19	45	a 4.12	3.57	a 10.5	.604	.150	28.999
July.	35	5.4	a23.32	75.41	62	6.06	3.60	7.88	37	a 4.45	4.10	8.1	.527	.089	a29.035
Aug.	37	6.0	a24.48	74.63	62	5.80	3.63	[illegible]	44	a 4.45	3.53	7.0	.577	.108	a29.063

* Additional statements relative to meteorological conditions may be found in an article on the Principal Meterological Conditions in Michigan in 1881, on pages 444–512 of this Report. Statements relative to the soil-moisture and ground water, by months in 1881, are given in Exhibits 5 and 6, and in summary foot-notes on pages 301–3.

† Explanations of statements in these columns, and other statements relative to the prevalence, in 1880, of the diseases under consideration, may be found in Tables 2, pp. 524–33, and 4, page 535, of this Report, and also in Diagrams 1, (p. 516), 2, (p. 543), 3, and 4, on following pages.

‡ Small numbers in this column indicate great prevalence in the localities where the disease occurred, as compared with other diseases; and large numbers a less prevalence.

§ Calculated from readings of dry-bulb and wet-bulb thermometers.

‖ Calculated for 18 respirations per minute, of 20 cubic inches of air each. The numbers in this column are just five-eighths of those in the next preceding column

¶ Assuming the air exhaled to be saturated with vapor at the temperature of 98° F., in which case each cubic foot of air contains 18.69 grains of vapor, and 18 respirations per minute, of 20 cubic inches of air each, make 11.68 Troy ounces of vapor exhaled daily. No correction has been made for expansion of the air after it is inhaled.

** The daily range from which numbers in this column were computed is the difference between the highest and the lowest of the four observations taken during the 24 hours, namely, at 7 A. M., 2 P. M., 9 P. M., of one day and 7 A. M. of the following day.

†† Not an average, but the extreme range for the year.

a Exceptions to Proposition 1, relating to bronchitis, page 540.

c There is no exception (for 1881) to Proposition 2, relating to bronchitis, page 540.

exhaled daily in excess of that inhaled was **greater** than the average, in months when **more** than the average per cent of reports stated presence of Bronchitis; and that **more** vapor was inhaled and a **less** excess exhaled daily in months **when** the per cent of reports stating presence of Bronchitis was **less** than the average.

Proposition 3 would also hold true in relation to pneumonia, membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, whooping-cough, rheumatism neuralgia, and pulmonary consumption, treated in Exhibits 41, 43, 45, 47, 49, 51, 53, 55, 57, and 59, on following pages.

What per cent of the weekly reports received in 1881 stated presence of Bronchitis is graphically represented by months in Diagram 1, page 516.

The evidence of Exhibit 39 confirms that of similar exhibits relating to Bronchitis, in previous Reports.

What per cent of the reports received stated presence of Bronchitis by months in each of the years 1877-81, also the average for those years, and a comparison of 1881 with that average are shown in Exhibit 40, below.

EXHIBIT 40.—SICKNESS FROM BRONCHITIS, 1877-81.—*By Year and Months for each of the five Years 1877-81, Stating on What Per Cent of the Weekly Reports received Bronchitis was reported present, and comparing the per cents for 1881 with the average for corresponding months in those Years.*

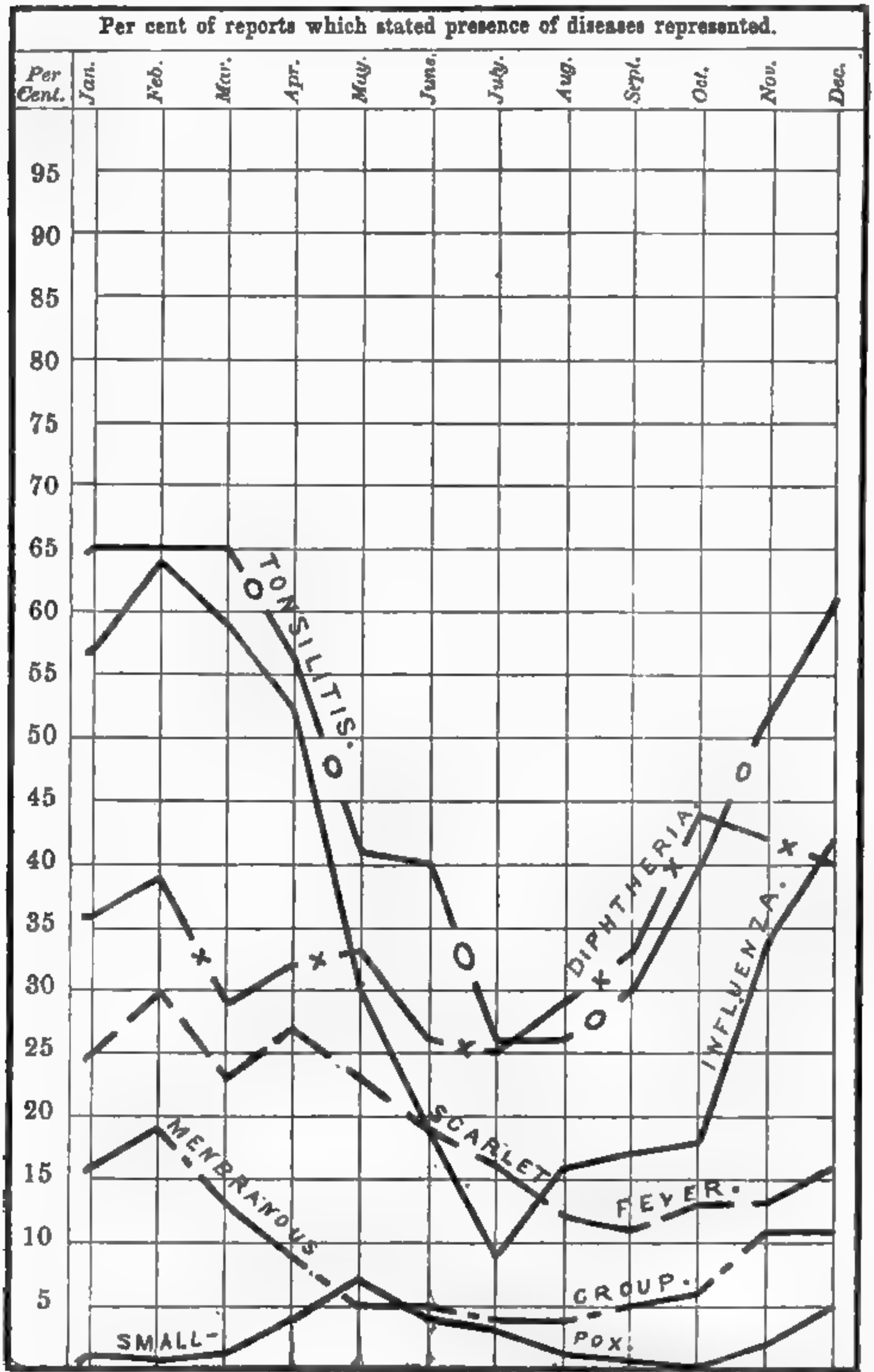
YEARS, ETC.	MONTHS.												
	Ann. Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 Years, 1877-81	62	81	81	78	72	59	50	38	38	46	54	68	75
1877	53	76	72	72	65	46	31	25	22	37	48	71	77
1878	64	77	75	74	71	66	56	41	45	55	60	73	81
1879	64	83	87	83	78	63	54	40	41	50	59	65	77
1880	64	81	84	84	68	59	57	44	45	46	57	67	72
1881	62	86	86	80	78	62	53	38	37	44	44	66	68
In 1881 Greater than Av. 1877-81	=	5	5	2	6	3	3	=	....	....	....	....	....
In 1881 Less than Av. 1877-81	......	....	....	....	....	....	....	....	1	2	10	2	7
Av. 4 Years, 1878-81	64	82	83	80	71	63	55	41	42	49	55	68	75
In 1881 Greater than Av. 1878-81	......	4	3	....	[illegible]	....	....	....	....	....	....	....	....
In 1881 Less than Av. 1878-81	2	....	....	....	....	1	2	3	5	5	11	2	7

RELATIONS OF PNEUMONIA TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.*—That **more** than the average per cent of weekly reports stated the presence of pneumonia in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of the reports stated the presence of pneumonia in months when these conditions were **less** than the average for the year. In Exhibit 41, page 544, the letter *a* marks exceptions to this proposition for the year 1881.

* Explanations of Propositions 1 and 2 are printed on page 546. A summary statement is printed at the close of this article, in Exhibit 78.

DIAGRAM 2.—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1881.



Designed by Henry B. Baker.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of pneumonia in months when the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of pneumonia in months when these conditions were **greater** than the average for the year. In Exhibit 41, below, the letter *b* marks exceptions to this proposition for the year 1881.

What per cent of the weekly reports received in 1881 stated presence of pneumonia is graphically represented by months in Diagram 1, page 516.

EXHIBIT 41.—PNEUMONIA.—*Stating for the Year and for Each Month of the Year 1881, What Per Cent of the Weekly Reports of Diseases Stated Presence of Pneumonia, and What were the Meteorological Conditions as observed at the Office of the State Board of Health, Lansing, Mich., which is near the center of the thickly-settled part of the State.*—See Propositions 1 and 2, pages 542–544.*

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Pneumonia.†	Per Cent of Weekly Reports Stating Presence of Pneumonia.†	Av. Order of Prevalence where Present †,‡	Temperature, Degrees, F.: Av. Daily Range, by Registering Thermometers,—Observed at 7 A. M.	Temperature, Degrees, F.: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere,§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily: Relative, Per Ct. of Saturation.	Humidity: Absolute—Grs. of Vapor in a Cu. Ft. of Air.	Vapor, Inhaled and Exhaled. (Gr., Troy.): Vapor Inhaled by one person in 24 Hours.‖	Vapor Exhaled from air Passages in 24 H., in Excess of that Inh'd.¶	Av. Per Cent of Cloudiness.	Ozone,—Relative, Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 2 P. M.	Ozone: Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer	Pressure of Atmosphere, Inches of Mercury. (Reduced to 32° F.) Range: Monthly, and for year	Range: Av. Daily, by Obsvns. at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
YEAR 1881.	41	5.4	††112	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	[illegible]	29.017
More than the Av. Per Cent of Pneumonia. Feb.	73	4.6	a19.61	22.27	80	1.40	.56	10.80	66	a3.75	5.54	11.0	1.336	.302	29.071
Jan..	69	4.2	15.65	16.96	81	1.06	[illegible]	11.00	65	4.53	5.45	a7.3	1.202	.248	29.077
Mar.	62	4.8	a14.68	30.59	78	1.76	1.10	10.58	62	4.52	6.00	10.4	1.017	.214	a28.981
April	61	5.0	21.33	43.23	a64	2.49	1.36	10.12	a46	4.50	6.07	9.8	a.717	a.149	a28.978
May.	51	5.1	24.10	b56.94	a61	b4.24	3.03	8.65	a32	a3.94	a4.26	a8.4	a.707	a.118	29.039
Dec..	47	4.4	a12.58	35.29	75	2.10	1.31	10.37	62	a3.89	a3.77	11.2	.947	.215	29.056
Average..	41	5.4	19.64	49.59	70	3.54	2.21	9.47	54	[illegible]	[illegible]	9.6	.843	.186	29.017
Less than the Av. Per Cent of Pneumonia. Nov.	33	5.8	15.57	b38.76	a74	b2.37	1.46	10.20	a67	3.57	a5.30	a14.6	a1.069	a.279	a29.067
June.	28	5.5	a21.43	65.99	67	5.07	3.17	6.51	a56	3.73	a4.80	8.4	.541	.154	28.940
Oct..	21	7.3	19.84	53.63	a75	3.94	2.46	9.22	a65	2.77	3.62	8.7	.928	a.206	a29.089
Sept.	19	7.6	a23.53	71.33	65	5.59	3.49	6.19	45	a4.12	3.57	a10.3	.654	150	28.999
July.	18	7.7	a23.32	75.41	62	6.08	3.90	7.63	37	a4.45	4.10	8.1	.537	.089	a29.035
Aug.	14	8.4	a24.48	74.63	62	5.80	3.83	8.05	44	a4.45	3.53	7.0	.577	.106	a29.083

*, †, ‡, §, ‖, ¶, **, ††. See footnotes with these marks in Exhibit 39, page 541.

a An exception to the proposition that **more** than the average per cent of weekly reports stated presence of pneumonia in months when the meteorological condition named at the head of the column was **greater** than the average for the year; and **less** in months when the same condition was **less** than the average. See proposition 1, relating to pneumonia, page 542.

b An exception to the proposition that **more** than the average per cent of weekly reports stated presence of pneumonia in months when the meteorological condition named at the head of the column was **less** than the average for the year; and **less** in months when the same condition was **greater** than the average for the year. See Proposition 2, relating to pneumonia, above.

Diagram 1, page 516, graphically represents by months what per cent of the weekly reports received in 1881 stated the presence of Bronchitis, and what per cent stated the presence of pneumonia.

What per cent of the weekly reports received stated presence of pneumonia by months in each of the years 1877–81 is stated in Exhibit 42, below, where are also given an average for those years and a comparison of 1881 with that average.

EXHIBIT 42.—SICKNESS FROM PNEUMONIA, 1877–81.—*By Year and Months for each of the five Years 1877–81, Stating on what Per Cent of the Weekly Reports received Pneumonia was Reported Present, and comparing the Per Cents for 1881 with the Average for corresponding Months in those Years.*

YEARS, ETC.	Ann. Av.	MONTHS.											
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 5 years, 1877–81	41	65	71	66	59	48	27	18	15	19	23	37	51
1877	40	70	67	63	55	38	23	16	14	15	23	40	63
1878	41	54	60	61	56	45	33	22	18	18	28	40	55
1879	41	60	80	74	62	40	26	19	15	23	22	29	51
1880	42	62	73	72	62	43	24	16	13	18	23	39	49
1881	41	69	73	62	61	51	28	10	14	19	21	36	47
In 1881 Greater than average 1877–81	=	4	2	....	2	[illegible]	1	=	..	=	....	....	....
In 1881 Less than average 1877–81	......	....	....	4	....	...	....	....	1	....	2	1	4
Average 4 years 1878–81	41	64	72	67	60	45	28	19	15	20	24	36	51
In 1881 Greater than average 1878–81	=	5	1	....	1	6	=	....	....	....	....	=	....
In 1881 Less than average 1878–81	......	....	....	5	....	....	....	1	1	1	3	....	4

RELATIONS OF MEMBRANOUS CROUP TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.*—That **more** than the average per cent of weekly reports stated the presence of membranous croup in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less than** the average per cent of reports stated the presence of membranous croup in months when these conditions were **less** than the average for the year. In Exhibit 43, page 546, the letter *a* marks exceptions to this proposition for 1881.

As regards monthly range of atmospheric pressure, there is, for 1881, no exception to Proposition 1.

PROPOSITION 2.*—That **more** than the average per cent of weekly reports stated the presence of membranous croup in months when the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year, and **less** than the average per cent of reports stated the presence of membranous croup in months when these conditions were **greater** than the average for the year.

* Comments on Propositions 1 and 2 are given on page 540; and a summary of the evidence of Exhibit 43 is given in Exhibit 73, near the close of this article.

In Exhibit 43, below, it is shown that there is, for 1881, but one exception to Proposition 2, relating to membranous croup.

What per cent of the reports received in 1881 stated presence of membranous croup is graphically represented by months in Diagram 2, page 543.

For the year 1881 and for every month, except May and December, membranous croup was reported present on a greater proportion of the card-reports received than for the five years 1877–81, or for the corresponding months in those years. There may be a connection between the increased prevalence of diphtheria, referred to on page 547, and the increased prevalence of croup,—as it is sometimes difficult to distinguish between these diseases, and it would not be strange if cases of diphtheria should sometimes be reported as croup. What per cent of the reports stated presence of membranous croup, by months, in each of the years 1877–81 is stated in Exhibit 44, page 547, where are also given an average for those years and a comparison of 1881 with that average.

EXHIBIT 43.—MEMBRANOUS CROUP.—*Stating for the Year and for Each Month of the Year 1881, What Per Cent of the Weekly Reports of Diseases Stated Presence of Membranous Croup, and What were the Meteorological Conditions as Observed at the Office of the State Board of Health, Lansing, Michigan, which is near the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Membranous Croup.†		Per Cent of Weekly Reports Stating Presence of Membranous Croup.†	Av. Order of Prevalence where Present.†,‡	Temperature, Degrees F: Av. Daily Range, by Registering Thermometers, Observed at 7 A. M.	Temperature, Degrees F: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M. Daily: Relative—Per Ct. of Saturation.	Humidity: Absolute—Grs. of Vapor in a Cu. Ft. of Air.	Vapor Inhaled and Exhaled (Oz., Troy.): Vapor Inhaled by one Person in 24 Hours.‖	Vapor Exhaled from Air Passages in 24 H., in Excess of that Inhal'd.¶	Av. Per Cent of Cloudiness	Ozone,—Relative, Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 2 P. M.	Ozone: Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer	Pressure of Atmosphere, Inches of Mercury, Corrected for Temp.: Range: Monthly, and for Year.	Range: Av. Daily, by Observ. at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
Year 1881.		9	8.2	††112°	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	.186	29.017
More than Av. per ct of Mem. Croup.	Feb.	19	7.0	a 19.01	22.27	80	1.40	.88	10.80	68	a3.75	5.54	11.0	1.326	.302	29.071
	Jan.	16	6.8	a 16.65	16.96	81	1.08	.65	11.00	65	4.62	5.45	a7.3	1.202	.248	29.077
	Mar.	13	7.8	a 14.68	30.59	78	1.70	1.10	10.55	62	4.52	6.00	10.4	1.017	.214	a28.921
	Nov.	11	7.6	a 15.57	33.78	74	2.37	1.48	10.20	67	a3.67	5.30	14.6	1.069	.279	29.037
	Dec.	11	7.1	a 12.55	35.26	75	2.10	1.31	10.37	62	a3.39	a3.77	11.2	.947	.215	29.030
Average		9	8.2	19.84	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	c.813	.186	29.017
Less than Av. Per Cent of Membranous Croup.	April	9	8.0	a21.33	b43.28	64	b2.49	1.56	10.12	46	a4.50	a6.07	a9.8	.717	.149	28.978
	Oct.	6	8.3	19.84	53.63	a75	3.94	2.46	9.22	a65	2.77	3.52	8.7	.826	a.206	a29.089
	Sept.	5	11.9	a22.63	71.33	65	5.59	3.49	8.19	45	a4.12	3.57	a10.3	.634	.150	28.999
	May.	5	8.5	a24.10	66.94	61	4.81	3.03	8.65	32	3.94	4.26	8.4	.707	.110	a29.038
	June	5	9.1	a21.43	65.99	67	5.07	3.17	8.51	a58	3.73	a4.39	8.4	.511	.154	28.940
	July.	4	10.7	a23.32	75.41	62	6.08	3.80	7.88	37	a4.45	4.10	8.1	.527	.089	a29.035
	Aug.	4	13.3	a24.48	74.63	62	5.80	3.63	8.03	41	a4.45	3.53	7.0	.577	.106	a29.063

*, †, §, ‖, ¶, **, ††. See foot-notes with these marks, in Exhibit 39, page 541.

a Exceptions to Proposition 1, relating to membranous croup, on page 545.

b An exception to Proposition 2, relating to membranous croup, on page 545.

c As regards monthly range of barometer, there is (for 1881) no exception to Proposition 1, relating to membranous croup, page 545.

EXHIBIT 44.—SICKNESS FROM MEMBRANOUS CROUP, 1877-81.—*By Year and Months for each of the five Years 1877–81, Stating on what Per Cent of the Weekly Reports received Membranous Croup was reported present, and comparing the Per Cents for 1881 with the Averages for corresponding Months in those Years.*

YEARS, ETC.	Ann. Av.	Months.											
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average, 5 years 1877-81	7	13	11	9	8	5	3	2	2	3	5	9	12
1877	0	14	10	9	8	8	3	2	2	3	4	7	10
1878	7	10	6	9	[illegible]	5	3	0.4	0.4	2	6	14	16
1879	7	10	10	9	10	5	2	0.3	1	3	5	7	14
1880	6	10	8	7	7	5	4	1	3	3	6	8	11
1881	9	16	19	13	9	5	5	4	4	5	6	11	11
In 1881 Greater than average 1877-81	2	3	8	4	1	=	2	2	2	2	1	2	....
In 1881 Less than average 1877-81	......	....	....	....	....	....	....	....	....	....	....	....	1

DIPHTHERIA.

For the year 1881, and for each month in that year, diphtheria was reported present by a greater proportion of the observers and on a greater proportion of the card-reports received, than the average for the five years, 1877-81, or for corresponding months in those years. The per cents for each of those periods are printed in Table 1, pages 519-21, and Exhibit 46, below.

EXHIBIT 46.—SICKNESS FROM DIPHTHERIA, 1877–81.—*By Year and Months for each of the five Years, 1877–81, Stating on What Per Cent of the Weekly Reports received Diphtheria was reported present, and comparing the per cents for 1881 with the average for corresponding months in those Years.*

YEARS, ETC.	Ann. Av.	Months.											
		Jan.	Feb.	Mar.	April.	May	June.	July.	Aug.	Sept	Oct.	Nov.	Dec.
Av. 5 Years, 1877–81	26	33		25	24	20	17	17	19	23	33	37	37
1877	19	33	24	19	16	8	10	10	7	12	25	29	26
1878	23	30	24	23	22	14	12	12	16	19	27	25	[illegible]
1879	29	39	38	26	23	20	20	15	24	23	34	44	42
1880	27	27	30	29	30	23	18	21	18	27	35	36	36
1881	34	36	39	29	32	33	26	25	29	33	44	42	40
In 1881 Greater than Av. 1877-81	8	3	2	4	8	13	9	8	10	10	11	5	3

RELATIONS OF DIPHTHERIA TO METEROLOGICAL CONDITIONS.

PROPOSITION 1.*—That **more** than the average per cent of weekly reports stated the presence of diphtheria in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of

* Explanations of Propositions 1 and 2 are given on page 540; and a summary of the evidence in Exhibit 45 is given in Exhibit 73, near the close of this article.

cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of reports stated presence of diphtheria in months when these conditions were **less** than the average for the year. In Exhibit 45, below, the letter *a* marks exceptions to this proposition for the year 1881.

PROPOSITION 2.*—That **more** than the average per cent of weekly reports stated the presence of diphtheria in months when the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of diphtheria in months when these conditions were **greater** than the average for the year. In Exhibit 45, below, the letter *b* marks exceptions to this proposition for the year 1881.

What per cent of the weekly reports in each month in 1881 stated the presence of diphtheria is graphically represented in Diagram 2, page 543.

EXHIBIT 45.—DIPHTHERIA.—*Stating, for the Year, and for each Month of the Year 1881, what Per Cent of the Weekly Reports of Diseases Stated Presence of Diphtheria, and what were the Meteorological Conditions as observed and recorded at the Office of the State Board of Health, Lansing, Michigan, which is near the center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Diphtheria.†	Per Cent of Weekly Reports Stating Presence of Diphtheria.†	Average Order of Prevalence where Present. ‡	Temperature, Degrees F. — Av. Daily Range, by Registering Thermometers, Observed at 7 A. M.	Temperature, Degrees F. — Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere § Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily. — Relative—Per Ct. of Saturation.	Humidity — Absolute — Grs. of Vapor in a Cu. Ft. of Air.	Vapor Inhaled and Exhaled, (Oz., Troy.) — Vapor Inhaled by one Person in 24 hours.‖	Vapor Exhaled from Air Passages 24 H., in Excess of that inh'd.¶	Average Per Cent of Cloudiness.	Ozone,—Relative. Scale of 10 Degrees of Coloration — Day Observation,—† A. M. to 2 P. M.	Night Observation,—† 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury. (Reduced to 32° F.) — Range — Monthly and for Year.	Range — Av. Daily, by Observations at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
YEAR, 1881.	34	5.6	††112	49.59	70	3.54	2.21	9.47	54	[illegible]	4.66	9.6	1.402	.186	29.017
More than Av. Per Ct. of Diphtheria. Oct.	44	5.4	19.84	b53.03	75	b3.04	2.46	9.22	66	a2.77	a3.62	a8.7	a.828	.206	29.069
Nov.	42	4.9	a15.57	38.78	74	2.37	1.46	10.20	67	a3.87	5.30	14.6	1.009	.279	29.037
Dec.	40	4.3	a12.55	35.29	73	2.10	1.31	10.37	62	a3.39	a3.77	11.2	.947	.216	a29.056
Feb.	39	5.5	a19.61	22.27	80	1.40	.88	10.60	68	a3.75	5.64	11.0	1.326	.302	29.071
Jan.	30	5.3	a18.65	10.98	81	1.09	.68	11.00	65	4 52	5.45	a7.3	1.208	.248	29 077
Average...	34	5.6	19.84	49.59	70	3.54	2.21	9.47	54	4.00	4.60	9.6	.848	.186	29.017
Less than Average Per Ct. of Diphtheria. Sept.	33	5.9	a22.53	71.33	65	5.69	3.49	8.10	45	a4.12	3.57	a10.3	.634	.160	28.999
May.	33	6.1	a24.10	66.94	61	4.84	3.03	8.66	32	3.94	4.26	8.4	.707	.116	a29.028
April	32	5.8	a21.33	b43.23	64	b2.49	1.56	10.12	46	a4.50	a6.07	a9.8	.717	.149	28.976
Aug.	29	8.4	a24.48	74.63	62	5.80	3.63	8.05	44	a4.45	3.63	7.0	577	.106	a29.069
Mar.	29	6.1	14.08	30.59	a 78	b1.76	1.10	10.59	a 62	a4.62	a6.00	a10.4	a1.017	a.214	28.921
June	26	6.3	a21.43	63.99	67	5.07	3.17	8.51	a 58	3.73	a4.80	8.4	.511	.154	28.940
July	25	7.1	a23.32	73.41	62	6.06	3.60	7 88	37	a4.45	4.10	8.1	.527	.069	a29.035

*, †, ‡, §, ‖, ¶, **, ††. See foot-notes with these marks, in Exhibit 39, page 541.
a An exception to Proposition 1, relative to diphtheria, on page 547.
b An exception to Proposition 2, relative to diphtheria, above.

RELATIONS OF TONSILITIS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That **more** than the average per cent of weekly reports stated the presence of Tonsilitis in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of reports stated the presence of Tonsilitis in months when these conditions were **less** than the average for the year. In Exhibit 47, below, the letter *a* marks exceptions to this proposition for the year 1881.

Explanations of propositions 1 and 2, are given on page 540; and a summary of the evidence in Exhibit 47 is given in Exhibit 73, near the close of this article.

EXHIBIT 47.—TONSILITIS.—*Stating, for the Year and for each Month of the Year 1881, what Per Cent of the Weekly Reports of Diseases Stated Presence of Tonsilitis, and what were the Meteorological Conditions as observed at the Office of the State Board of Health, Lansing, Michigan, which is near the center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Tonsilitis.†		Per Cent of Weekly Reports Stating Presence of Tonsilitis.†	Av. Order of Prevalence where Present.†, ‡	Temperature, Degrees F.: Av. Daily Range, by Registering Thermometers, Observed at 7 A. M.	Temperature, Degrees F.: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily: Relative—Per Ct. of Saturation.	Humidity of Atmosphere: Absolute—Grs. of Vapor in a Cu. Ft. of Air.	Vapor Inhaled and Exhaled. (Oz., Troy.): Vapor Inhaled by one Person in 24 Hours.‖	Vapor Inhaled and Exhaled: Vapor Exhaled from Air Passages in 24 H., in Excess of that Inh'ld.¶	Av. Per Cent of Cloudiness.	Ozone,—Relative, Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 2 P. M.	Ozone: Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury, (Reduced to 32° F.) Range: Monthly and for Year.	Pressure: Range: Av. Daily, by Obsvns. at 7 A. M., 2 P. M., and 9 P. M.**	Pressure: Average Pressure.
Year 1881.		48	4.6	††112	49.59	70	3.54	2 21	9.47	54	4.00	4.66	9.6	1.402	.186	29.017
More than Av. Per Ct. of Tonsilitis.	Mar.	65	4.0	a14.68	30.59	78	1.76	1.10	10.58	62	4.52	6.00	10.4	1.017	.214	a28.981
	Feb..	65	4.0	a19.01	22 27	80	1.40	[illegible]	10.80	66	a3.75	5 54	11.0	1.326	.302	29.071
	Jan..	65	3.9	a18.65	16.98	81	1.08	.66	11.00	65	4.52	5 45	a 7.3	1.202	.243	29.077
	Dec..	61	3.6	a12.55	35.28	75	2.10	1.31	10.87	62	a3.39	a3.77	11 2	.947	.215	29.066
	April	56	4.5	21 33	43.23	a 64	2.49	1.56	10.12	a 48	4.50	6.07	9.8	a.717	a.149	a28.978
	Nov	53	[illegible]	a15.57	38.78	74	2.37	1.48	10.20	67	a3.97	5.30	14 6	1,009	.279	29.037
Average...		48	4.6	19.84	c49.59	70	c3.54	2.21	9.47	54	4.00	4.66	9.6	.843	.186	29.017
Less than Av. Per Ct. of Tonsilitis.	May.	41	4.9	a24.10	60.94	61	4.84	3 03	8.65	32	3 94	4 28	8.4	.707	.116	a29.086
	June	40	4.8	a21.43	65.99	67	5.07	3 17	8.61	a 58	3.73	a4.80	8.4	.541	.164	28.940
	Oct..	40	5 2	19.64	53 63	a 75	3.94	2 46	9 22	a 65	2 77	3 52	8.7	.828	a.206	a29.069
	Sept	30	6.2	a22.53	71.33	65	5.59	3.49	8.10	45	a4.12	3.57	a10.8	.654	.150	28,999
	July.	26	5.7	a23.32	75.41	62	6.08	3 60	7.89	37	a4.45	4 10	6.1	.327	.089	a29.035
	Aug.	26	6.4	a24.48	74.63	62	5.80	3.63	8.05	44	a4 45	3.53	7.0	.577	.106	a29.063

*, †, ‡, §, ¶, **, ††. See foot-notes with these marks, in Exhibit 39, page 541.
a Exceptions to Proposition 1, relative to tonsilitis, above
c There is, for 1881, no exception to Proposition 2, relative to tonsilitis, page 550.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of Tonsilitis in months when the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of Tonsilitis in months when these conditions were **greater** than the average for the year. In Exhibit 47, page 549, there is no exception to this proposition, for the year 1881.

What per cent of the weekly reports in each month in 1881 stated the presence of Tonsilitis is graphically represented in Diagram 2, page 543.

What per cent of the weekly reports received stated presence of Tonsilitis in each of the years 1879–81 is stated by months in Exhibit 48, below, where is also given an average for those years and a comparison of 1881 with that average.

EXHIBIT 48.—SICKNESS FROM TONSILITIS 1879–81.—*By Year and Months for each of the three Years 1879–81, Stating on What Per Cent of the Weekly Reports received Tonsilitis was reported present, and comparing the per cents for 1881 with the average for corresponding months in those years.*

YEARS, ETC	Ann. Av.	MONTHS.											
		Jan.	Feb.	Mar	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 3 Years, 1879–81	47	61	63	62	52	43	41	27	28	33	42	54	61
1879	45	54	60	60	52	44	43	28	23	32	43	52	60
1880	49	64	63	61	48	44	39	28	30	36	44	59	63
1881	48	65	65	65	56		40	26	26	30	40	52	61
In 1881 Greater than Average 1877–81.	1	4	2	3	4		....	....	....	....	....	....	....
In 1881 Less than Average 1877–81	......	....	...	....		2	1	1	2	3	2	2	==

INFLUENZA.

EXHIBIT 50.—SICKNESS FROM INFLUENZA, 1877–81.—*By Year and Months for Each of the five Years 1879–81, Stating on What Per Cent of the Weekly Reports received Influenza was reported present, and comparing the per cents for 1881 with the average for corresponding months in those years.*

YEARS, ETC.	Ann. Av.	MONTHS.											
		Jan	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 Years, 1877–81	41	59	66	61	53	37	27	20	22	28	31	43	50
1877	41	56	65	60	50	33	27	28	15	25		43	40
1878	44	49	53	53	54	40	37	27	24	33		50	57
1879	45	70	61	70	66	41	20	21	23	33	30	38	51
1880	42	65	69	60	45	34	23	14	3	23	33	48	52
1881	35	57	64	59	52	30	19		16	17	18	3	42
In 1881 Less than Average 1877–81	6	2	2	2	1	7	8	11	6	11	13	9	8

For the year 1881, and for every month in that year, influenza was reported present on a less proportion of the weekly card-reports received than the average for the five years 1877–81, or for the corresponding months in those years. The per cents for these periods are stated by months in Exhibit 50, page 550.

For the years 1879, 1880, and 1881, the six months in which influenza was least prevalent (May, June, July, Aug., Sept., and Oct.), were the months in which intermittent fever was most prevalent.

RELATIONS OF INFLUENZA TO METEOROLOGICAL CONDITIONS.

EXHIBIT 49.—Influenza.—*Stating for the Year and for Each Month of the Year 1881, What Per Cent of the Weekly Reports of Diseases Stated Presence of Influenza, and What were the Meteorological Conditions as Observed and Recorded at the Office of the State Board of Health, Lansing, Michigan, which is near the center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Influenza †		Per Cent of Weekly Reports Stating Presence of Influenza.†	Av. Order of Prevalence where Present.†, ‡.	Temperature, Degrees F: Av. Daily Range, by Registering Thermometers, Observed at 7 A. M	Temperature, Degrees F: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M	Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M. Daily: Relative—Per Ct. of Saturation.	Humidity of Atmosphere.§: Absolute—Grs. of Vapor in a Cu. Ft. of Air.	Vapor Inhaled and Exhaled. (Oz., Troy.): Vapor Inhaled by one Person in 24 Hours.‖	Vapor Inhaled and Exhaled: Vapor Exhaled from Air Passages in 24 H., in Excess of that Inhal'd.¶	Av. Per Cent of Cloudiness.	Ozone,—Relative, Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 9 P. M.	Ozone: Night Observation,—9 P. M to 7 A. M	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury. (Reduced to 32° F.): Range: Monthly, and for Year.	Range: Av. Daily, by Observ'ns, at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
Year 1881.		35	3.5	††[illegible]	49.59	70	3.54	2.21	9.47	51	4.0	4.66	9.6	1.402	.186	29.017
More than Av. Per Ct. of Influenza.	Feb.	64	2.2	a19.61	22.27	80	1.40	.88	10.80	68	a3.75	5.34	11.0	1.326	.302	29.071
	Mar.	59	2.3	a14.68	30.59	78	1.76	1.10	10.55	62	4.32	6.00	10.4	1.017	.214	a28.821
	Jan.	57	2.2	a18.65	16.98	81	1.08	.68	11.00	63	4.52	5.45	a7.3	1.202	.248	29.077
	April	52	3.3	21.33	43.23	a64	2.49	1.56	12.12	a40	4.50	6.07	9.8	a.717	a.149	a28.978
	Dec.	42	3.0	a12.55	35.28	75	2.10	1.31	10.37	62	a3.30	a3.77	11.2	.947	.215	29.066
Average		35	3.5	19.81	49.59	70	3.54	2.21	9.47	51	4.00	4.66	9.6	.943	.186	29.017
Less than Av. Per Ct. of Influenza	Nov.	31	3.8	15.57	b39.78	a74	b2.37	1.48	10.20	a67	3.87	a5.30	a11.6	a1.069	a.270	a29.037
	May.	20	4.1	a24.10	66.91	61	4.84	3.03	8.65	32	3.94	4.26	8.4	.707	.116	a29.039
	June	19	5.1	a21.43	65.99	67	5.07	3.17	8.51	a58	3.72	a4.80	8.4	.541	.154	28.940
	Oct.	18	4.3	19.84	53.63	a75	3.91	2.46	9.22	a65	2.77	3.52	8.7	.828	a.206	a29.089
	Sept.	17	5.3	a22.53	71.33	65	5.59	3.49	8.10	45	a4.12	3.57	a10.3	.634	.150	28.999
	Aug.	16	5.9	a21.48	74.63	62	5.80	3.63	8.05	44	a4.43	3.53	7.0	.577	.106	a29.063
	July.	9	7.2	a23.32	75.41	62	6.09	3.80	7.88	37	a4.45	4.10	8.1	.527	.089	a29.033

*, †, ‡, §, ‖, ¶, **, ††. See foot-notes, with these marks, in Exhibit 39, page 541.

a An exception to Proposition 1, relative to influenza, below.

b An exception to Proposition 2, relative to influenza, on page 552. For 1881 there is but one month which forms an exception to Proposition 2.

Proposition 1.—That **more** than the average per cent of weekly reports stated the presence of influenza in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the

average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year, and **less** than the average per cent of reports stated the presence of influenza in months when these conditions were **less** than the average for the year. In Exhibit 49, page 551, the letter *a* marks exceptions to this proposition for the year 1881.

Explanations of propositions 1 and 2, are given on page 540; and a summary of the evidence of Exhibit 49 is given in Exhibit 73, near the close of this article.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of influenza in months when the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year, and **less** than the average per cent of reports stated the presence of influenza in months when these conditions were **greater** than the average for the year. In Exhibit 49, page 551, the letter *b* marks exceptions to this proposition for the year 1881.

What per cent of the weekly reports in each month in 1881 stated the presence of influenza is graphically represented in Diagram 2, page 543.

SCARLET FEVER.

EXHIBIT 52.—SICKNESS FROM SCARLET FEVER, 1877–81.—*By Year and Months for each of the Five Years 1877–81, Stating on what Per Cent of the Weekly Reports received Scarlet Fever was reported Present, and comparing the Per Cents for 1881 with the Average for corresponding Months in those Years.*

YEARS, ETC.	Ann. Av.	Months.											
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 5 Years 1877–81	21	27	27	27	25	23	18	15	14	15	19	20	21
1877	21	26	26	22	24	21	18	16	17	16	19	23	18
1878	25	23	29	33	21	21	20	17	20	25	28	26	22
1879	23	35	29	36	31	25	17	17	13	14	22	24	23
1880	15	22	21	17	21	13	14	8	7	9	12	17	18
1881	19	25	30	23	27	23	19	16	12	11	13	13	16
In 1881 Greater than Av. 1877–81	......	....	3	....	2	1	1	1	....	....	....	....	....
In 1881 Less than Av. 1877–81	2	2	....	4	....	....	....	....	2	4	6	7	5

RELATIONS OF SCARLET FEVER TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That **more** than the average per cent of weekly reports stated the presence of Scarlet Fever in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere was **greater** than the average for the year; and **less** than the average per cent of reports stated the presence of Scarlet Fever in months when these conditions were **less** than the average for the year. In Exhibit 51, page 553, the letter *a* marks exceptions to this proposition for the year 1881.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of Scarlet Fever in months when the average daily temperature and the absolute humidity of the atmosphere were **less** than the aver-

age for the year, and **less** than the average per cent of reports stated the presence of Scarlet Fever in months when these conditions were **greater** than the average for the year. In Exhibit 51, below, the letter *b* marks exceptions to this proposition for the year 1881.

What per cent of the weekly reports received in 1880 stated presence of Scarlet Fever is graphically represented by months in Diagram 2, page 543.

What proportion of the weekly reports received stated presence of Scarlet Fever by months in each of the years 1877–81 is stated in Exhibit 52, page 552, where are also given an average for those years and a comparison of 1881 with that average.

EXHIBIT 51.—SCARLET FEVER.—*Stating, for the Year and for each Month of the Year 1881, what Per Cent of the Weekly Reports of Diseases in Michigan Stated Presence of Scarlet Fever, and what were the Meteorological Conditions, as observed and recorded at the Office of the State Board of Health, Lansing, Michigan, which is near the center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Scarlet Fever.†		Per Cent of Weekly Reports Stating Presence of Scarlet Fever.†	Average Order of Prevalence where Present.†, ‡	Temperature, Degrees F.: Av. Daily Range, by Registering Thermometers, Observed at 7 A. M.	Temperature: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere § Av. of Observations at 7 A. M., 2 P. M., and 9 P. M. Daily: Relative—Per Ct. of Saturation.	Humidity: Absolute—Grs. of Vapor in a Cu. Ft. of Air.	Vapor Inhaled and Exhaled (Oz., Troy.): Vapor Inhaled by one Person in 24 Hours.‖	Vapor Exhaled from Air Passages in 24 H., in Excess of that Inh'd ¶	Av. Per Cent of Cloudiness.	Ozone,—Relative, Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 2 P. M.	Ozone: Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury. (Reduced to 32° F.) Range: Monthly and for Year	Range: Av. Daily, by Obsv'ns at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
Year 1881.		19	6.7	††112	49.50	70	3.54	2.21	9.47	54	4.0	4.66	9.6	1.402	.186	29.017
More than Av. Per Ct. of Scarlatina.	Feb.	30	5.4	a19.61	22.27	80	1.40	.88	10.80	68	a 3.75	5.64	11.0	1.336	.302	29.071
	April	27	6.7	21.33	43.23	a 64	2.49	1.56	10.12	a 48	4.60	6.07	[illegible]	a .717	a .149	a28.976
	Jan.	25	5.3	a18.65	16.96	81	1.08	.68	11.00	65	4.32	5.45	a 7.3	1.202	.246	29.077
	Mar	23	7.0	a14.68	30.69	76	1.76	1.10	10.58	63	4.52	6.00	10.4	1.017	.214	a28.921
	May.	23	6.2	24.10	b60.94	a 61	b 4.84	3.03	8.65	a 32	a 3.94	a 4.26	a 8.4	a .707	a .116	29.036
Average...		19	6.7	19.84	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	.845	.186	29.017
Less than Average Per Ct. of Scarlatina.	June	19	6.7	a21.43	65.99	67	5.07	3.17	8.51	a 56	3.73	a 4.60	8.4	.541	.154	28.940
	Dec.	16	5.6	12.55	b35.28	a 75	b 2.10	1.31	10.37	a 62	3.39	3.77	a 11.2	a .947	a .315	a29.058
	July.	16	7.2	a23.32	75.41	62	6.03	3.80	7.83	37	a 4.45	4.10	8.1	.527	.083	a29.035
	Oct.	13	7.8	19.84	53.63	a 75	3.94	2.46	9.22	a 65	2.77	3.52	6.7	.823	a .206	a29.069
	Nov.	13	7.9	15.57	b38.78	a 74	b2.[illegible]7	1.48	10.20	a 67	3.87	a 5.30	a 14.6	a1.069	a .279	a29.037
	Aug.	12	7.7	a24.48	74.63	62	5.80	3.63	6.95	44	a 4.43	3.53	7.0	.677	.106	a29.063
	Sept.	11	8.3	a23.53	71.83	65	5.59	3.40	5.10	43	a 4.12	3.57	a 10.3	.634	.160	28.999

*, †, ‡, §, ‖, ¶, **, ††. See foot-notes with these marks, in Exhibit 39, page 541.
a An exception to Proposition 1, relative to scarlet fever, on page 552.
b An exception to Proposition 2, relative to scarlet fever, pages 552-3.

WHOOPING-COUGH.

For the year 1881, and for every month in that year, Whooping-cough was reported present by a smaller per cent of the observers and on a smaller per cent of the report cards than the average for the five years 1877–81, or for corresponding months in those years. The comparisons are made in Exhibit 54, below, and Table 1, pages 519–21. By Exhibit 53, page 555, it may be seen that the prevalence of Whooping-cough bears no very close relations to meteorological conditions.

EXHIBIT 54.—SICKNESS FROM WHOOPING-COUGH, 1877–81.—*By Year and Months for each of the five Years, 1877–81, Stating on What Per Cent of the Weekly Reports received Whooping-cough was reported present, and comparing the per cents for 1881 with the average for corresponding months in those years.*

YEARS, ETC.	Ann. Av.	MONTHS.											
		Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 5 Years, 1877–81	23	23	23	21	19	21	23	25	24	25	21	24	23
1877	21	23	25	20		22	25	25	25	19	16	17	15
1878	21	14		3		17	17	22	23	27	33	36	36
1879	23	30	28	23	19	18	20	3	20	26	21	25	18
1880	33	29	33	33	33	36		37	35	33	25	34	19
1881	16	20	10			15	13		8	16	13	17	18
In 1881 Less than Av. 1877–81	7	3	7	7	8	0	8	4	6	7	8	7	7

RELATIONS OF WHOOPING-COUGH TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That **more** than the average per cent of weekly reports stated the presence of whooping-cough in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of reports stated presence of whooping-cough in months when these conditions were **less** than the average for the year. In Exhibit 53, page 555, the letter *a* marks exceptions to this proposition for the year 1881.

Explanations of propositions 1 and 2, are given on page 540, and a summary of the evidence of Exhibit 53 is given in Exhibit 73, near the close of this article.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of whooping-cough in months when the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of whooping-cough in months when these conditions were **greater** than the average for the year. In Exhibit 53, page 555, the letter *b* marks exceptions to this proposition for the year 1881.

What per cent of the weekly reports in each month in 1881 stated presence of whooping-cough is graphically represented in Diagram 4, page 557.

EXHIBIT 53.—WHOOPING COUGH.—*Stating for the Year and for Each Month of the Year 1881, What Per Cent of the Weekly Reports of Diseases in Michigan Stated Presence of Whooping-cough, and What were the Meteorological Conditions, Observed at the Office of the State Board of Health, Lansing, Michigan, which is near the Center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Whooping-cough.†		Per Cent of Weekly Reports Stating Presence of Whooping-cough.†	Av. Order of Prevalence where Present.†, ‡	Temperature, Degrees F. Av. Daily Range, by Registering Thermometers,—Observed at 7 A. M.	Temperature, Degrees F. Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily. Relative—Per Ct. of Saturation.	Humidity of Atmosphere.§ Absolute—Grs. of Vapor in a Cu. Ft. of Air.	Vapor Inhaled and Exhaled, (Oz., Troy.) Vapor Inhaled by one Person in 24 Hours.∥	Vapor Inhaled and Exhaled, (Oz., Troy.) Vapor Exhaled from Air Passages in 24 H., in Excess of that Inhal'd.¶	Av. Per Cent of Cloudiness.	Ozone,—Relative, Scale of 10 Degrees of Coloration. Day Observation,—7 A. M. to 2 P. M.	Ozone,—Relative, Scale of 10 Degrees of Coloration. Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury, Corrected for Temp. Range. Monthly, and for Year.	Pressure of Atmosphere. Range. Av. Daily by Obsvns. at 7 A. M., 2 P. M., and 9 P. M.**	Pressure of Atmosphere. Average Pressure.
Year 1881.		16	6.3	††112°	40.60	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	.186	29.017
More than Av. Per Ct. of Whooping-cough.	July.	21	5.9	23.32	b75.41	62	b6.06	3.90	7.88	a37	4.45	4.10	a8.1	a.527	a.089	29.035
	Jan.	20	6.3	a18.65	16.98	81	1.06	[illegible]	11.00	65	4.52	5.45	a7.3	1.202	248	29.077
	Sept.	18	6.5	22.53	b71.33	a65	b5.59	3.49	8.19	a45	4.12	a3.57	10.3	a.654	a.150	a28.999
	Aug.	18	7.2	24.46	b74.63	a62	b5.80	3.63	8.05	a44	4.45	a3.53	a7.0	a.577	a.106	29.063
	Nov.	17	5.5	a15.57	33.78	74	2.37	1.48	10.20	67	a3.87	5.30	14.6	1.009	.279	29.037
	Dec.	16	6.2	a12.55	35.28	75	2.10	1.31	10.37	62	a3.30	a3.77	11.2	.947	.215	29.056
	Feb.	16	6.0	a19.61	22.27	80	1.40	[illegible]	10.80	68	a3.75	5.54	11.0	1.336	.302	29.071
Av. Month.		16	6.3	19.84	49.50	70	3.54	2.21	9.47	54	4.00	4.66	9.6	.848	.186	29.017
Less than Av. Per Ct. of W'p'g-cough	June.	15	6.2	a21.45	65.09	67	5.07	3.17	8.51	a59	3.73	a4.60	8.4	.541	.154	28.940
	May.	15	6.2	a24.10	60.04	61	b4.84	3.03	8.65	32	3.94	4.36	8.4	.707	.116	a29.039
	Mar.	14	6.1	14.68	b30.59	a78	b1.76	1.10	10.58	a62	a4.52	a6.00	a10.4	a1.017	a.214	28.921
	Oct.	13	7.2	19.81	53.63	a75	3.94	2.46	9.22	a63	2.77	5.52	8.7	.828	a.206	b29.089
	April	11	6.8	a21.33	b43.23	61	b2.49	1.56	10.12	46	a4.50	6.07	a9.8	717	.149	28.976

*, †, ‡, §, ∥, ¶, **, ††. See foot-notes with these marks in Exhibit 39, page 541.
a Exceptions to Proposition 1, relative to Whooping-cough, page 554.
b Exceptions to Proposition 2, relative to Whooping-cough, page 554.

RELATIONS OF RHEUMATISM TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That **more** than the average per cent of weekly reports stated the presence of Rheumatism in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of the reports stated the presence of Rheumatism in months when these conditions were **less** than the average for the year. In Exhibit 55, page 558, the letter *a* marks exceptions to this proposition for the year 1881.

Explanations of propositions 1 and 2 are given on page 540; and a summary of the evidence of Exhibit 55 is given in Exhibit 73, near the close of this article.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of Rheumatism in months when the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of Rheumatism in months when these conditions were **greater** than the average for the year. In Exhibit 55, page 558, the letter *b* marks exceptions to this proposition for the year 1881.

The per cent of weekly reports stating presence of Rheumatism in each month in 1881 is stated in the line for the year 1881 in Exhibit 56, below, and is graphically represented in Diagram 4, page 557.

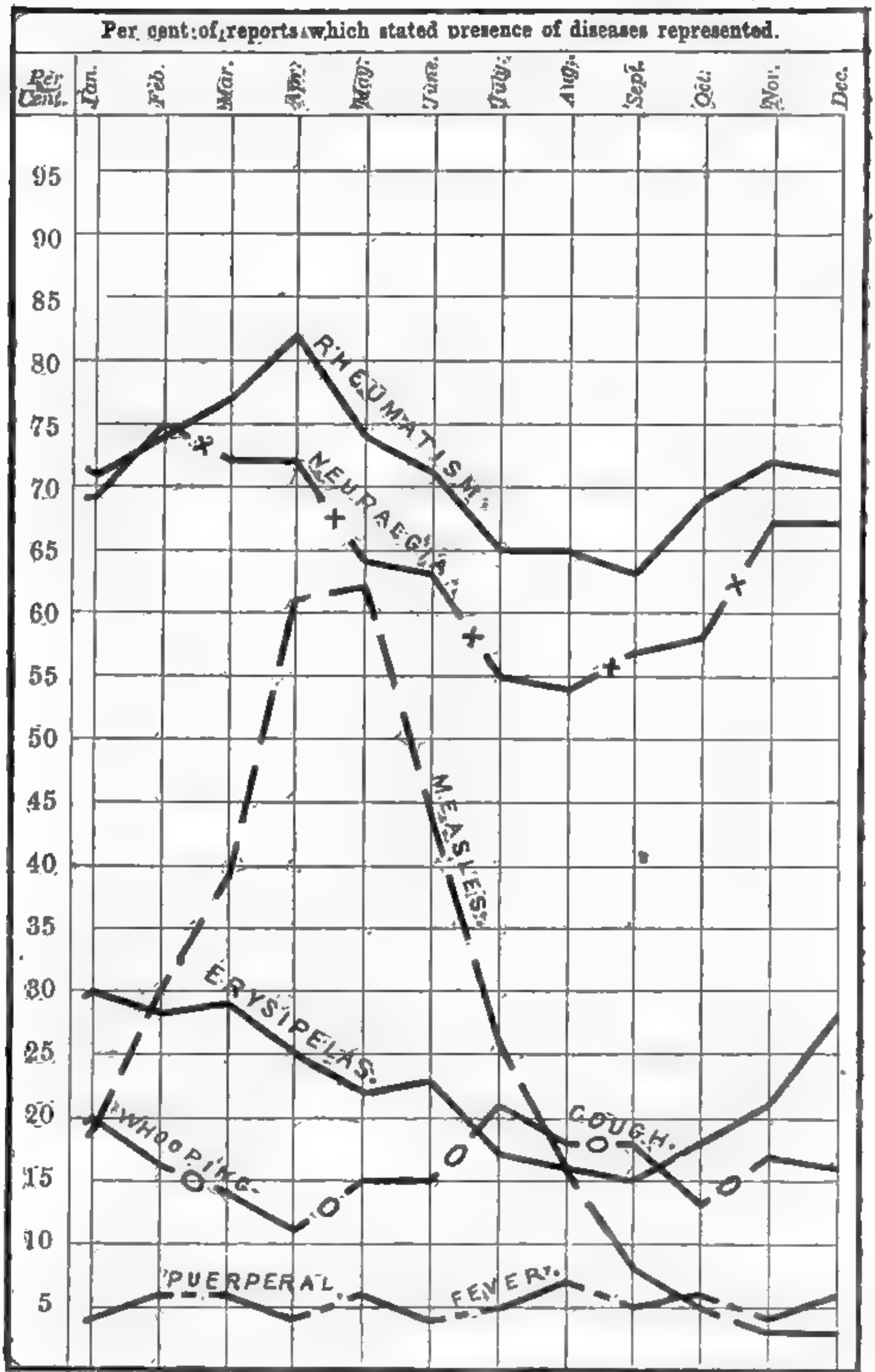
What per cent of the weekly reports received stated presence of Rheumatism is stated by months for each of the five years 1877-81, in Exhibit 56, below, where are also given an average for those years, and a comparison of 1881 with that average.

EXHIBIT 56.—SICKNESS FROM RHEUMATISM, 1877-81.—*By Year and Months for each of the five Years 1877-81, Stating on What Per Cent of the Weekly Reports received Rheumatism was reported present, and comparing the per cents for 1881 with the average for corresponding months in those Years.*

YEARS, ETC.	Ann. Av.	MONTHS.											
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 Years, 1877-81	69	73	75	75	74	69	65	58	53	59	67	73	75
1877	60	68	69	64	61	60	43	42	33	43	65	79	75
1878	68	75	75	77	73	67	65	57	51	69	65	67	79
1879	73	80	78	79	61	75	71	65	57	66	70	75	74
1880	71	81	80	79	70	70	68	63	61	61	66	72	74
1881 (See this line in Diagram 4.)	71	71	74	77	82	74	71	65	[illegible]	63	69	72	71
In 1881 Greater than Av. 1877-81	2	....	....	2	8	5	6	7	12	4	2	....	....
In 1881 Less than Av. 1877-81	......	4	1	....	....	....	....	....	....	....	....	1	4

A marked correspondence between prevalence of rheumatism and the varying degree of a meteorological condition seems to be in relation to the average temperature. By Diagram 4, page 557, it may be seen that rheumatism increased from January to April (inclusive), 1881. By Exhibits 11 and 12, page 454, it may be seen that from January to April, inclusive, the average temperature was lower than the average for each of those months in a period of years.

DIAGRAM 4.—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1881.



Designed by Henry B. Baker.

EXHIBIT 55.—RHEUMATISM.—*Stating, for the Year and for each Month of the Year 1881, what Per Cent of the Weekly Reports of Diseases Stated Presence of Rheumatism, and what were the Meteorological Conditions as observed at the Office of the State Board of Health, Lansing, Michigan, which is near the Center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Rheumatism.†		Per Cent of Weekly Reports Stating Presence of Rheumatism.†	Av. Order of Prevalence where Present.‡	Temperature, Degrees, F.: Av. Daily Range, by Registering Thermometers,—Observed at 7 A. M.	Temperature, Degrees, F.: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily: Relative—Per Ct. of Saturation.	Humidity of Atmosphere.§: Absolute.—Grs. of Vapor in a Cu. Ft. of Air	Vapor Inhaled and Exhaled (Oz., Troy.): Vapor Inhaled by one Person in 24 Hours.‖	Vapor Inhaled and Exhaled (Oz., Troy.): Vapor Exhaled from Air Passages in 24 H., in Excess of that Inh'd.¶	Av. Per Cent of Cloudiness.	Ozone,—Relative. Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 2 P. M.	Ozone,—Relative: Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury. (Reduced to 32° F.): Range: Monthly, and for Year	Pressure of Atmosphere: Range: Av. Daily, by Obsvns. at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
YEAR 1881.		71	4.6	††11?°	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	.186	29.017
More than Av. Per Ct. of Rheumatism.	April	82	4.4	21.33	43.23	a64	2.49	1.56	10.12	a46	4.50	6.07	9.8	a .717	a .149	a28.978
	Mar.	77	4.2	a14.06	30.89	78	1.70	1.10	10.58	62	4.52	0.00	10.4	1.017	.214	a28.921
	May.	71	4.3	24.10	b66.94	a61	b4.84	3.03	8.65	a32	a 3.94	a 4.26	a 8.4	a .707	a .116	29.033
	Feb.	74	4.5	a19.61	22.27	80	1.40	.88	10.80	68	a 3.75	5.54	11.0	1.326	.302	29.071
	Nov.	72	4.2	a15.67	33.78	74	2.37	1.43	10.40	67	a 3.87	5.30	14.6	1.060	.279	29.087
Average...		71	4.6	19.84	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	.643	.186	29.017
Less than the Average Per Cent of Rheumatism.	Jan.	71	4.4	18.65	b16.98	81	b1.03	.68	11.00	a65	a 4.52	5.45	7.3	a1.202	a .246	a29.077
	June	71	4.1	a21.43	65.99	57	5.07	3.17	8.51	a58	3.73	a 4.80	8.4	.541	.154	28.940
	Dec.	71	5.0	12.55	b35.28	75	b2.10	1.31	10.37	a62	3.30	3.77	a11.2	a .947	a .215	a29.056
	Oct.	69	4.8	19.84	53.63	75	3.94	2.46	9.22	a65	2.77	3.62	8.7	.828	a .208	a29.089
	July.	65	5.1	a23.32	75.41	62	6.08	3.80	7.68	37	a 4.45	4.10	8.1	.527	.080	a29.085
	Aug.	65	5.5	a24.48	74.69	62	5.80	3.63	8.05	44	a 4.45	3.53	7.0	.577	.100	a29.063
	Sept.	63	5.7	a22.53	71.33	65	5.59	3.49	8.19	45	a 4.12	3.57	a 10.3	.654	.150	28.999

*, †, ‡, ‖, §, ¶, **, ††. See foot-notes with these marks, in Exhibit 39, page 541.
a An exception to Proposition 1, relative to rheumatism, on page 555.
b An exception to Proposition 2, relative to rheumatism, on page 556.

RELATIONS OF NEURALGIA TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That **more** than the average per cent of weekly reports stated the presence of neuralgia in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of reports stated the presence of neuralgia in the months when these conditions were **less** than the average for the year. In Exhibit 57, page 559, the letter *a* marks exceptions to this proposition for the year 1881.

Explanations of propositions 1 and 2, are given on page 540; and a summary of the evidence of Exhibit 57 is given in Exhibit 73, near the close of this article.

PROPOSITION 2.—That more than the average per cent of weekly reports stated the presence of neuralgia in months when the average daily temperature, and the absolute humidity of the atmosphere were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of neuralgia in months when these conditions were greater than the average for the year. There was no exception to this proposition for 1880; and in Exhibit 57, below, it may be seen that there was none for the year 1881.

The per cent of weekly reports stating presence of neuralgia in each month in 1881 is stated in the line for 1881 in Exhibit 58, page 560 and is graphically represented in Diagram 4, page 557.

What proportion of the weekly card-reports received stated presence of neuralgia by months in each of the years 1879-81 is stated in Exhibit 58, page 560, where are also given an average of those years and a comparison of 1881 with that average.

EXHIBIT 57.—NEURALGIA.—*Stating for the Year and for Each Month of the Year 1881, What Per Cent of the Weekly Reports of Diseases Stated Presence of Neuralgia, and What were the Meteorological Conditions as observed and recorded at the Office of the State Board of Health, Lansing, Mich., which is near the center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Neuralgia.†				Temperature, Degrees, F.		Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily.		Vapor, Inhaled and Exhaled. (Oz., Troy.)			Ozone,—Relative, Scale of 10 Degrees of Coloration.			Pressure of Atmosphere. Inches of Mercury. (Reduced to 32° F.)		
		Per Cent of Weekly Reports Stating Presence of Neuralgia.†	Av. Order of Prevalence where Present.‡	Av. Daily Range, by Registering Thermometers,—Observed at 7 A. M.	Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Relative, Per Ct. of Saturation.	Absolute—Grs. of Vapor in a Cu. Ft. of Air.	Vapor Inhaled by one person in 24 Hours.‖	Vapor Exhaled from Air Passages in 24 H., in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation,—7 A. M. to 2 P. M.	Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer	Range. Monthly, and for year.	Range. Av. Daily, by Obsvns. at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
YEAR 1881.		63	4.	††112*	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	.186	29.017
More than Av. Per Ct. of Neuralgia.	Feb.	75	.3	a19.61	22.27	80	1.40	.88	10.80	68	a5.75	5.54	11.0	1.526	.302	29.071
	April	73	4.	21.33	43.27	a64	2.49	1.56	10.12	a46	4.30	0.07	9.8	a.717	a.149	a28.978
	Mar.	72	4.1	a14.63	20.59	78	1.76	1.10	10.55	62	4.52	0.00	10.4	1.017	.214	a28.831
	Jan.	69	4.3	a18.65	16.98	81	1.08	.65	11.00	65	4.52	5.45	a7.8	1.202	.248	29.077
	Dec.	67	3.6	a12.55	23.98	75	2.10	1.31	10.37	62	a3.39	a3.71	11.2	.947	.215	29.056
	Nov.	67	4.1	a15.57	38.73	71	2.37	1.48	10.20	67	a3.87	5.30	14.6	1.069	.279	29.037
Average..		65	4.	19.84	c49.69	70	c3.54	2.21	9.47	54	4.00	4.66	9.6	.843	.186	29.017
Less than Av. Per Ct. of Neuralgia.	May.	64	4.	a24.10	56.94	61	4.84	3.03	8.65	52	3.94	4.26	8.4	.707	.116	a29.038
	June	63	3	a21.43	65.99	67	5.07	3.17	8.51	a58	3.73	a4.80	8.4	.541	.134	28.940
	Oct..	58	4.	19.61	53.63	a75	3.94	2.46	9.22	a65	2.77	3.52	8.7	.828	a.200	a29.089
	Sept.	57	4.9	a22.53	71.33	65	5.59	3.49	8.19	43	a4.12	3.57	a10.3	.654	150	28.999
	July	55	4.8	a23.32	75.41	62	6.08	3.60	7.88	37	a4.15	4.10	8.1	.527	.080	a29.035
	Aug.	54	5.2	a24.48	74.63	62	5.80	3.03	8.05	44	a4.45	3.53	7.0	.577	.106	a29.003

*, †, ‡, §, ‖, ¶, **, †† See footnotes with these marks in Exhibit 39, page 541.
a An exception to Proposition 1, relative to neuralgia, on page 558.
c For 1881 there is no exception to Proposition 2, relative to neuralgia, at the top of this page.

EXHIBIT 59.—SICKNESS FROM NEURALGIA, 1879–81.—*By Year and Months for each of the three Years 1879–81, Stating on what Per Cent of the Weekly Reports received Neuralgia was reported present, and comparing the Per Cents for 1881 with the Average for corresponding months in those Years.*

YEARS, ETC.	Ann. Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 3 years 1879–81	[illegible]	63	69	72	70	61	61	53	53	54	61	66	67
1879	[illegible]	49	59	66	63	55	59	52	52	56	62	65	66
1880	54	[illegible]	[illegible]	75	69	[illegible]	61	53	53	50	64	65	69
1881	65	[illegible]	75	72	72	64	63	55	54	57	58	67	63
In 1881 Greater than Av. 1879–81	2	6	7	=	3	3	2	2	1	3	....	1	....
In 1881 Less than Av. 1879–81	.....	....	....	....	....	....	....	....	....	....	3	....	2

CONSUMPTION.

What proportion of the weekly reports received stated presence of Consumption, by months in each of the years 1877–81, is stated in Exhibit 60, below, where are also given an average for the years 1878–81 and a comparison of 1881 with that average.

EXHIBIT 60.—SICKNESS FROM CONSUMPTION, 1877–81.—*By Year and Months for each of the four Years 1878–81, Stating on what Per Cent of the Weekly Reports received Consumption was reported present, and comparing the Per Cents for 1881 with the averages for corresponding Months in those Years.*

MONTHS, ETC.	Ann. Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 4 years 1878–81*	70	69	72	72	75	71	70	68	65	68	70	71	68
1877*	66	65	67	67	71	67	66	63	59	62	67	70	67
1878	71	67	72	76	75	72	68	68	65	70	73	73	71
1879	70	71	71	69	77	74	73	69	67	67	69	67	64
1880	68	65	69	70	72	70	69	66	62	66	66	68	70
1881	71	74	76	73	76	69	68	67	67	70	73	74	67
In 1881 Greater than Av. 1878–81	1	5	4	1	1	....	....	....	2	2	3	3	....
In 1881 Less than Av. 1878–81	.....	....	....	....	....	2	2	1	....	....	....	....	1

* As consumption was not printed on the first blanks, or on all used in 1877, that year is excluded from the average line.

RELATIONS OF PULMONARY CONSUMPTION TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That more than the average per cent of weekly reports stated the presence of Pulmonary Consumption in months when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were greater than the average for the year; and less than the average per cent of the reports stated the presence of Pulmonary Consumption in months when these conditions were less than the average for

the year. In Exhibit 59 the letter *a* marks exceptions to this proposition for 1881.

Explanations of propositions 1 and 2 are given on page 540; and a summary of the evidence of Exhibit 59 is given in Exhibit 73 page 575.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of Pulmonary Consumption in months when the average daily temperature and the absolute humidity of the Atmosphere were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of Pulmonary Consumption in months when these conditions were **greater** than the average for the year. In Exhibit 59, below, the letter *b* marks exceptions to this proposition for the year 1881.

What per cent of the reports stated presence of Pulmonary Consumption in each month in 1881, is graphically represented in Diagram 5, page 573.

EXHIBIT 59.—CONSUMPTION.—*Stating for the Year and for Each Month of the Year 1881, What Per Cent of the Weekly Reports of Diseases Stated Presence of Pulmonary Consumption, and What were the Meteorological Conditions at the same time, as observed and recorded at the Office of the State Board of Health, Lansing, Mich., which is near the center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Pulmonary Consumption.†		Per Cent of Weekly Reports Stating Presence of Pul. Consumption.†	Av. Order of Prevalence where Present †.‡	Temperature, Degrees, F.: Av. Daily Range, by Registering Thermometers,—Observed at 7 A. M.	Temperature, Degrees, F.: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily: Relative, Per Ct. of Saturation.	Humidity: Absolute—Grs. of Vapor in a Cu. Ft. of Air	Vapor, Inhaled and Exhaled. (Oz., Troy.): Vapor Inhaled by one person in 24 Hours.‖	Vapor Exhaled from Air Passages in 24 H., in Excess of that Inh'd.¶	Av. Per Cent of Cloudiness.	Ozone,—Relative, Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 2 P. M.	Ozone: Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer	Pressure of Atmosphere, Inches of Mercury (Reduced to 32° F.): Range: Monthly, and for year	Range: Av. Daily, by Obs'ns at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
Year 1881		71	5.6	††11.2°	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	.186	29.017
More than Av. Per Ct. of Consumption	Feb.	76	5.8	a19.61	22.27	80	1.40	.98	10.80	68	a3.75	5.54	11.0	1.326	.302	29.071
	April	76	5.7	21.38	43.23	a64	2.49	1.56	10.12	a46	4.50	6.07	9.8	a.717	a.140	a28.976
	Nov.	74	5.4	a15.67	33.78	74	2.37	1.48	10.20	67	a3.67	5.80	14.6	1.069	.279	29.037
	Jan.	74	5.5	a13.65	16.98	81	1.08	.68	11.00	65	4.52	5.45	a7.3	1.202	.248	29.077
	Mar.	73	5.9	a14.68	30.59	78	1.70	1.10	10.58	62	4.52	6.00	10.4	1.017	.214	a28.891
	Oct.	73	5.8	10.84	b53.63	75	b3.94	2.48	9.22	65	a2.77	a3.52	a8.7	a.828	.206	29.069
Average		71	5.6	19.64	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	.945	.186	29.017
Less than Av. Per Ct. of Consumption.	Sept.	70	6.2	a22.63	71.33	65	5.59	3.49	8.19	45	a4.12	3.37	a10.5	.654	.150	28.999
	May.	69	5.2	a24.10	66.94	61	4.84	3.03	8.65	32	3.94	4.26	8.4	.707	.116	a29.039
	June.	68	5.2	a21.43	[illegible]	67	5.07	3.17	8.51	a58	3.73	a4.80	8.4	.541	.154	28.940
	Aug.	67	6.2	a21.48	74.63	62	[illegible]	3.63	8.05	44	a4.45	3.53	7.0	.577	.106	a29.068
	Dec.	67	4.6	12.55	b35.28	a73	b2.10	1.31	10.37	a62	3.39	3.77	a11.3	a.947	a.215	a29.055
	July.	67	5.6	a23.32	75.41	69	6.06	3.90	7.88	37	a4.45	4.10	8.1	.527	.089	a29.035

*, †, ‡, §, ‖, ¶, **, ††. See footnotes with these marks in Exhibit 39, page 541.
a An exception to Proposition 1, relative to consumption, on page 560.
b An exception to Proposition 2, relative to consumption, at the top of this page.

RELATIONS OF DIARRHEA TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That **more** than the average per cent of weekly reports stated the presence of diarrhea in months when the average daily range of

temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of reports stated the presence diarrhea in months when these conditions were **less** than the average for the year. In Exhibit 61, below, the letter *a* marks exceptions to this proposition for the year 1881.

Explanations of propositions 1 and 2, are given on page 540, and a summary of the evidence in Exhibit 61 is given in Exhibit 74, page 576.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of diarrhea in months when the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of diarrhea in months when

EXHIBIT 61.—DIARRHEA.—*Stating, for the Year, and for each Month of the Year 1881, what Per Cent of the Weekly Reports of Diseases Stated Presence of Diarrhea, and what were the Meteorological Conditions as observed at the Office of the State Board of Health, Lansing, Michigan, which is near the center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Diarrhea.†	Per Cent of Weekly Reports Stating Presence of Diarrhea.‡	Average Order of Prevalence where Present. ‖,‡	Temperature, Degrees F. — Av. Daily Range, by Registering Thermometers, Observed at 7 A. M.	Temperature, Degrees F. — Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere § Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily. — Relative Per Ct. of Saturation	Humidity — Absolute — Grs. of Vapor in a Cu. Ft. of Air.	Vapor Inhaled and Exhaled, (Oz., Troy.) — Vapor Inhaled by one Person in 24 Hours.‖	Vapor Exhaled from Air Passages in 24 H., in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone,—Relative. Scale of 10 Degrees of Coloration — Day Observation, 7 A. M. to 2 P. M.	Ozone — Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury, (Reduced to 32° F.) Range — Monthly and for Year.	Range — Av. Daily, by Obsv'ns. at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
Year, 1881	32	3.9	††112°	49.39	70	3.54	2.21	9.47	54	4.00	4.00	9.6	1.402	.156	29.017
More than Av. Per Ct. of Diarrhea. Aug.	95	1.5	24.43	74.63	65	5.80	3.63	8.05	44	b4.45	3.53	7.0	a.577	a.106	29.063
July	91	2.4	23.32	73.41	63	6.00	3.90	7.88	37	b4.45	4.10	8.1	a.527	a.059	29.035
Sept.	90	2.6	22.33	71.33	65	5.30	3.49	8.18	45	b4.12	3.57	b10.3	a.654	a.150	a[illegible]
Oct.	70	2.9	19.34	53.63	b 75	3.94	2.46	9.22	b 63	2.77	3.52	5.7	a.823	.206	29.0[illegible]
June	65	3.7	21.43	65.99	67	5.07	2.17	8.51	b 38	3.73	b4.80	8.4	a.541	a.154	a28.940
Average	32	3.9	19.54	49.39	70	3.54	2.21	9.47	54	4.00	4.00	9.6	.943	.156	29.017
Less than Average Per Ct. of Diarrhea. Nov.	38	5.1	15.57	35.78	74	2.37	1.45	10.26	67	b3.87	5.20	14.6	a1.069	a.279	a29.037
May	35	5.2	a24.10	a60.94	b 61	a4.34	3.03	8.65	b 32	b3.94	4.28	b8.4	.707	.116	a29.038
April	33	3.4	a21.33	45.25	b 64	2.49	1.56	10.12	b 46	4.50	6.07	9.8	.717	.149	28.978
Mar	33	6.7	16.68	30.59	73	1.76	1.10	10.59	62	4.52	6.00	10.4	a1.017	a.214	28.921
Feb.	32	5.8	19.61	22.27	80	1.40	.88	10.90	68	b3.75	3.34	11.0	a1.226	a.302	a29.071
Dec.	30	4.6	12.55	35.25	75	2.10	1.31	10.37	62	b3.39	b3.77	11.2	a.947	a.215	a29.056
Jan.	29	5.1	15.63	16.96	81	1.05	.68	11.00	65	4.52	5.43	b 7.3	a1.202	a.248	a29.077

*, †, ‡, §, ‖, ¶, **, ††. See foot-notes with these marks, in Exhibit 39, page 541.
a An exception to Proposition 1, relative to diarrhea, above.
b An exception to Proposition 2, relative to diarrhea, above.

these conditions were **greater** than the average for the year. In Exhibit 61, page 562, the letter *b* marks exceptions to this proposition for 1881.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to proposition 1, it is true also that the quantity of vapor inhaled daily was **greater** than the average, and the quantity exhaled daily in excess of that inhaled was **less** than the average, in months when **more** than the average per cent of reports stated presence of diarrhea; and that **less** vapor was inhaled and a **greater** excess exhaled daily in months when the per cent of reports stating presence of diarrhea was **less** than the average.

Proposition 3 is true also in relation to cholera infantum, intermittent fever, remittent fever, and typhoid fever, treated in Exhibits 63, 65, 67, and 69, pages 564, 566, and 567, and 570.

In Diagram 1, page 516, is graphically represented by months what per cent of the reports in each month in 1881 stated presence of diarrhea.

For the year 1881, and for every month in that year, Diarrhea was reported present on a greater proportion of the card reports received than the average for the five years 1877–81, or for the corresponding months in those years. The per cents for those months and years are stated in Exhibit 62. The disease was unusually prevalent in June, July, and October, 1881.

EXHIBIT 62.—SICKNESS FROM DIARRHEA, 1877-81.—*By Year and Months for each of the five Years 1877–81, Stating on what Per Cent of the Weekly Reports received Diarrhea was reported present, and comparing the Per Cents for 1881 with the Averages for corresponding Months in those Years.*

YEARS, ETC.	Ann. Av.	MONTHS.											
		Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 5 Years, 1877–81	46	25	25	28	28	34	45	79	90	83	56	33	26
1877	41	24	31	21	20	27	35	73	88	81	54	35	25
1878	41	26	29	34	27	33	33	64	84	80	47	23	20
1879	48	20	21	25	30	31	44	77	93	83	65	40	30
1880	47	25	23	25	28	40	56	91	93	89	50	27	24
1881	52	29	32	33	33	38	55	91	95	90	70	38	30
In 1881 Greater than Av. 1877–81	6	4	7	5	5	4	10	12	5	7	14	5	4

RELATIONS OF CHOLERA INFANTUM TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That **more** than the average per cent of weekly reports stated the presence of cholera infantum in months when the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of reports stated the presence of cholera infantum in months when these conditions were **less** than the average for the year. In Exhibit 63, page 564, the letter *a* marks exceptions to this proposition for the year 1881.

Explanations of propositions 1 and 2, are given on page 540; and a summary of the evidence of Exhibit 63 is given in Exhibit 74, page 576.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of cholera infantum in months when the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of cholera infantum in months when these conditions were **greater** than the average for the year. In Exhibit 63, below, the letter *b* marks exceptions to this proposition for 1881.

What per cent of all the weekly reports of sickness in each month in 1881 stated presence of cholera infantum is graphically represented by months in Diagram 5, page 573. What proportion of the weekly reports received stated presence of cholera infantum in each of the years 1877-81, is stated by months in Exhibit 64, page 565, where are also stated an average for those years, and a comparison of 1881 with that average. Cholera infantum seems to have been unusually prevalent in July, August, and September, 1881.

EXHIBIT 63.—CHOLERA INFANTUM.—*Stating for the Year and for Each Month of the Year 1881, What Per Cent of the Weekly Reports of Diseases Stated Presence of Cholera Infantum, and What were the Meteorological Conditions as Observed at the Office of the State Board of Health, Lansing, Michigan, which is near the center of the thickly-settled part of the State.**

MONTHS IN ORDER OF GREATEST PER CENT OF WEEKLY REPORTS STATING PRESENCE OF CHOLERA INFANTUM †		Per Cent of Weekly Reports Stating Presence of Cholera Infantum †	Av. Order of Prevalence where Present †,‡	Temperature, Degrees F: Av. Daily Range,—by Register of Thermometers, Observed at 7 A. M.	Temperature, Degrees F: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere § Av. of Observations at 7 A. M., 2 P. M., and 9 P. M. Daily: Relative—Per Ct. of Saturation	Humidity of Atmosphere: Absolute—Grs. of Vapor in a Cu. Ft. of Air.	Vapor Inhaled and Exhaled, (Oz., Troy.): Vapor Inhaled by one Person in 24 Hours.	Vapor Inhaled and Exhaled: Vapor Exhaled from Air Passages in 24 H., in Excess of that Inhaled ¶	Av. Per Cent of Cloudiness	Ozone,—Relative, Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 2 P. M.	Ozone: Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere, Inches of Mercury (Reduced to 32° F.): Range: Monthly, and for Year,	Pressure: Range: Av. Daily, by Observations at 7 A. M., 2 P. M., and 9 P. M. **	Pressure: Average Pressure.
YEAR 1881.		18	5.1	††112°	41.69	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	.186	29.017
More than Av. Per Cent.	Aug.	69	4.1	24.48	74.07	62	5.80	3.63	8.05	41	b1.45	3.53	7.0	a.577	a.106	29.043
	Sept.	51	4.6	22.53	71.33	65	5.59	3.49	8.19	45	b4.12	3.57	b10.3	a.651	a.150	a28.999
	July.	51	4.3	23.32	73.41	62	6.08	3.80	7.88	37	b4.45	4.10	8.1	a.527	a.089	29.036
	Oct.	18	6.6	19.84	51.63	b75	3.94	2.46	9.22	b65	2.77	3.52	6.7	a.828	.206	29.099
Average		18	5.1	19.84	49.30	70	3.54	2.21	9.47	54	4.00	4.66	9.6	.843	.186	29.017
Less than Av. Per Cent of Cholera Infantum.	June	17	6.3	a21.43	a65.99	b67	a5.07	3.17	8.51	58	b3.73	4.80	b8.4	.541	[illegible]	28.940
	Nov.	4	7.6	15.57	35.79	74	2.37	1.48	10.20	67	b3.87	5.30	14.6	a1.069	a.279	a29.037
	May.	8	6.6	a24.10	a66.04	b61	a4.84	3.03	8.65	b32	b3.94	b4.20	b8.4	.707	.116	a29.089
	Dec.	1	0.0	12.65	35.28	73	2.10	1.31	10.37	62	b3.89	b3.71	11.2	a.947	a.215	a29.058
	Mar.	1	7.7	14.68	30.39	78	1.76	1.10	10.55	62	4.52	6.00	10.4	a1.017	a.214	28.821
	Feb.	1	4.0	19.61	22.27	80	1.40	.88	10.80	68	b3.75	5.54	11.0	a1.326	a.302	a29.071
	Jan.	0	0	18.65	16.98	81	1.08	.68	11.00	65	4.52	5.45	b7.3	a1.202	a.348	a29.077
	April	0	0	a21.33	43.23	b64	2.49	1.56	10.12	b46	4.50	6.07	9.8	.717	.149	28.978

*, †, ‡, §, ‖, ¶, **, ††. See foot-notes with these marks, in Exhibit 39, page 541.
a Exceptions to Proposition 1, relating to cholera infantum, on page 563.
b An exception to Proposition 2, relating to cholera infantum, above.

EXHIBIT 64.—SICKNESS FROM CHOLERA INFANTUM, 1877–81.—*By Year and Months for each of the five Years, 1877–81, Stating on What Per Cent of the Weekly Reports received Cholera Infantum was reported present, and comparing the per cents for 1881 with the average for corresponding months in those years.*

YEARS, ETC.	Ann. Av.	Jan.	Feb.	Mar.	April.	May.	June.	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average, 5 years 1877–81	14	1	1	2	1	2		37	58	37	•	4	1
1877	11	1	0		2	3		24	46	31	13	4	1
1878	11	2	3	3	2	3	8	27	42	37	10	2	1
1879	14	2	2	4	2	0.4	5	35	57	51	[illegible]	4	1
1880	14	2	0.3	1	0.3	2	14	48	32	33	9	4	2
1881	18	0			0	3	17	51	69	51	18	4	1
In 1881 Greater than average 1877–81	4	—	=					14	16	14	7	=	=
In 1881 Less than average 1877–81	......	1						....		....	....	....	....

EXHIBIT 66.—SICKNESS FROM INTERMITTENT FEVER, 1877–81.—*By Year and Months for Each of the five Years 1877–81, Stating on What Per Cent of the Weekly Reports received Intermittent Fever was reported present, and comparing the per cents for 1881 with the average for corresponding months in those years.*

YEARS, ETC.	Ann. Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 Years, 1877–81	81	63	65	69	79	89	91	91	92	92	89	80	69
1877	75	47	52	57	70	85	90	90	90	69	87	51	75
1878	83	60	66	74	83	91	92	90	91	92	90	80	69
1879	82	63	69	73	81	89	90	93	92	93	85	78	66
1880	82	63	69	71	79	90	91	92	91	93	90	79	71
1881	82	67	69	70	84	88	91	92	94	92	91	83	69
In 1881 Greater than Av. 1877–81	1	4	4	1	5	....	=	1	2	=	2	3	=
In 1881 Less than Av. 1877–81	......	....	....	—	....	1	....	....	....	...	....	....	....

RELATIONS OF INTERMITTENT FEVER TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That **more** than the average per cent of weekly reports stated the presence of intermittent fever in months when the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of reports stated the presence of intermittent fever in months when these conditions were **less** than the average for the year. In Exhibit 65, page 566, the letter *a* marks exceptions to this proposition for the year 1881.

Explanations of propositions 1 and 2, are given on page 540; and a summary of the evidence of Exhibit 65 is given in Exhibit 74, page 576.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of intermittent fever in months when the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year, and **less** than the average per cent of reports stated the presence of intermittent fever in months when these conditions were **greater** than the average for the year. In Exhibit 65, below, the letter *b* marks exceptions to this proposition for 1881.

What per cent of the weekly reports received in 1881 stated presence of intermittent fever is graphically represented by months in Diagram 3, page 569.

What proportion of the weekly reports received stated presence of intermittent fever by months in the years 1877–81, is stated in Exhibit 66, page 565, where is also given an average for those years, and a comparison of 1881 with that average.

EXHIBIT 65.—INTERMITTENT FEVER.—*Stating for the Year and for Each Month of the Year 1881, What Per Cent of the Weekly Reports of Diseases in Michigan Stated Presence of Intermittent Fever, and What were the Meteorological Conditions, as Observed at the Office of the State Board of Health, Lansing, Michigan, which is near the Center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Intermittent Fever.†	Per Cent of Weekly Reports Stating Presence of Intermittent Fever.†	Av. Order of Prevalence where Present.†,‡	Temperature, Degrees F. — Av. Daily Range, by Registering Thermometers,—Observed at 7 A. M.	Temperature — Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily — Relative—Per Ct. of Saturation	Humidity — Absolute—Grs of Vapor in a Cu. Ft. of Air.	Vapor Inhaled and Exhaled. (Oz., Troy.) — Vapor Inhaled by one Person in 24 Hours.‖	Vapor Exhaled from Air Passages in 24 H., in Excess of that Inhal'd.¶	Av. Per Cent of Cloudiness.	Ozone,—Relative, Scale of 10 Degrees of Coloration. — Day Observation,—7 A. M. to 9 P. M.	Ozone — Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury. Reduced to 32° F. — Range — Monthly, and for Year.	Range — Av. Daily by Observ's at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
YEAR 1881.	82	2.4	††112°	49.50	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	186	29.017
More than Av. Per Ct. of Intermittent Fever. — Aug.	94	2.4	24.46	74.63	62	5.80	3.63	8.05	44	*b*4.45	3.53	7.0	*a*.577	*a*.106	29.063
July.	93	2.0	23.32	75.41	62	6.06	3.90	7.88	37	*b*4.45	4.10	8.1	*a*.527	*a*.099	29.035
Sept.	92	1.9	22.53	71.83	65	5.59	3.49	8.19	45	*b*4.12	3.57	*b*10.3	*a*.654	*a*.150	*a*28.999
Oct.	91	2.0	19.64	53.63	*b*75	3.04	2.46	9.22	*b*65	2.77	3.52	8.7	*a*.828	[illegible]	29.069
June.	[illegible]	1.7	21.43	65.99	67	5.07	3.17	8.51	*b*58	3.73	*b*4.80	8.4	*a*.541	*a*.154	*a*28.940
May.	88	2.0	24.10	60.94	61	4.84	3.03	8.65	32	3.94	4.26	8.4	*a*.707	*a*.116	29.036
April	84	2.5	21.33	*a*48.23	64	*a*2.49	1.56	10.12	46	*b*4.50	*b*6.07	*b*9.8	*a*.717	*a*.149	*a*28.978
Nov.	83	2.3	*a*15.57	*a*38.78	*b*74	*a*2.37	1.46	10.20	*b*67	3.87	*b*5.30	*b*14.6	1.009	.279	29.037
Average.	82	2.4	19.64	49.50	70	3.54	2.21	9.47	54	4.00	4.66	[illegible]	848	[illegible]	29.017
Less than Av. Per Cent. — Mar.	70	3.0	14.68	30.59	73	1.76	1.10	10.58	62	4.52	6.00	10.4	*a*1.017	*a*.214	28.921
Feb.	69	3.3	19.61	23.27	80	1.40	[illegible]	10.80	68	*b*3.75	5.64	11.0	*a*1.336	*a*.302	*a*29.071
Dec.	69	2.6	12.65	35.28	75	2.10	1.31	10.37	62	*b*3.30	*b*3.77	11.2	*a*.947	*a*.215	*a*29.056
Jan.	67	3.3	18.65	16.98	81	1.08	.68	11.00	65	4.52	5.45	*b*7.3	*a*1.202	*a*.248	*a*29.077

*, †, ‡, §, ‖, ¶, **, ††. See foot-notes with these marks in Exhibit 39, page 541.
a Exceptions to Proposition 1, relative to Intermittent Fever, page 565.
b Exceptions to Proposition 2, relative to Intermittent Fever, above.

RELATIONS OF REMITTENT FEVER TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That **more** than the average per cent of weekly reports stated the presence of Remittent Fever in months when the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and **less** than the average per cent of reports stated the presence of Remittent Fever in months when these conditions were **less** than the average for the year. In Exhibit 67, page 567, the letter *a* marks exceptions to this proposition for the year 1881.

Explanations of propositions 1 and 2 are given on page 540; and a summary of the evidence of Exhibit 67 is given in Exhibit 74, page 576.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of Remittent Fever in months when the relative humidity

EXHIBIT 67.—REMITTENT FEVER.—*Stating, for the Year and for each Month of the Year 1881, what Per Cent of the Weekly Reports of Diseases Stated Presence of Remittent Fever, and what were the Meteorological Conditions as observed at the Office of the State Board of Health, Lansing, Michigan, which is near the Center of the thickly-settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Remittent Fever.†		Per Cent of Weekly Reports Stating Presence of Remittent Fever.†	Av. Order of Prevalence where Present †.‡	Temperature, Degrees, F.: Av. Daily Range, by Registering Thermometers,—Observed at 7 A. M.	Temperature, Degrees, F.: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily: Relative—Per Ct. of Saturation.	Humidity of Atmosphere: Absolute—Grs. of Vapor in a Cu. Ft. of Air	Vapor Inhaled and Exhaled (Oz., Troy): Vapor Inhaled by one person in 24 Hours.‖	Vapor Inhaled and Exhaled: Vapor Exhaled (from Air Passages in 24 H., in Excess of that Inh'd.¶	Av. Per Cent of Cloudiness.	Ozone,—Relative. Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 9 P. M.	Ozone: Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury. (Reduced to 32° F.) Range: Monthly, and for Year.	Pressure: Range: Av. Daily, by Obsvns. at 7 A. M., 2 P. M., and 9 P. M.**	Pressure: Average Pressure.
YEAR 1881.		54	3.5	††112°	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	.186	29.017
More than Av. Per Ct. of Remittent Fever.	Oct.	69	3.1	19.84	53.63	b 75	2.94	2.46	9.22	b 65	2.77	3.52	8.7	a .928	.206	29.069
	Sept.	66	2.9	22.53	71.33	65	5.59	3.49	8.19	45	b 4.12	3.57	b 10.3	a .654	a .150	a28.999
	Aug.	63	4.0	24.46	74.63	62	5.80	3.63	8.06	44	b 4.45	3.53	7.0	a .577	a .106	29.063
	July.	58	3.8	23.82	75.41	62	6.06	3.80	7.88	37	b 4.45	4.10	8.1	a .627	a .089	29.035
	May.	57	3.1	24.10	66.94	61	4.84	3.03	8.65	52	3.94	4.26	8.4	a .707	a .116	29.093
	Nov.	56	3.3	a15.57	a38.76	b74	a2.37	1.49	10.20	b 67	3.87	b 5.30	b 14.0	1.069	.279	29.037
	June	55	3.2	21.43	65.09	67	5.07	3.17	8.51	58	3.73	b 4.80	8.4	a .541	a .154	a28.940
Average...		54	3.5	19.84	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	.543	.186	29.017
Less than Av. Per Cent of Remitt't F.	April	52	3.2	a21.33	43.23	b 64	2.49	1.56	10.12	b 46	4.50	6.07	9.8	.717	.149	a28.976
	Jan.	49	4.1	18.65	16.98	81	1.08	.08	11.00	65	4.52	5.45	b 7.3	a1.202	a .246	29.077
	Dec.	47	3.4	12.55	35.28	75	2.10	1.31	10.37	62	b 3.39	b 3.77	11.2	a .947	a .215	29.086
	Feb.	43	4.5	19.61	22.27	80	1.40	.88	10.60	68	b 3.75	5.54	11.0	a1.326	a .302	29.071
	Mar.	41	3.9	14.63	30.59	78	1.16	1.10	10.58	63	4.52	6.00	10.4	a1.017	a .214	a28.821

*, †, ‡, ‖, §, ¶, **, †† See foot notes with these marks, in Exhibit 39, page 541.
a An exception to Proposition 1, relative to remittent fever, above.
b An exception to Proposition 2, relative to remittent fever, above.

of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind, were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of Remittent Fever in months when these conditions were **greater** than the average for the year. In Exhibit 67, page 567, the letter *b* marks exceptions to this proposition for the year 1881.

In Diagram 3, page 569, is graphically represented by months what per cent of the reports in each month in 1881 stated presence of Remittent Fever.

What proportion of the weekly reports received stated presence of Remittent Fever by months in the years 1877-81 is stated in Exhibit 68, below, where are also given an average for those years and a comparison of 1881 with that average.

EXHIBIT 68.—SICKNESS FROM REMITTENT FEVER, 1877–81.—*By Year and Months for each of the five Years, 1877–81. Stating on What Per Cent of the Weekly Reports received Remittent Fever was reported present, and comparing the per cents for 1881 with the average for corresponding months in those Years.*

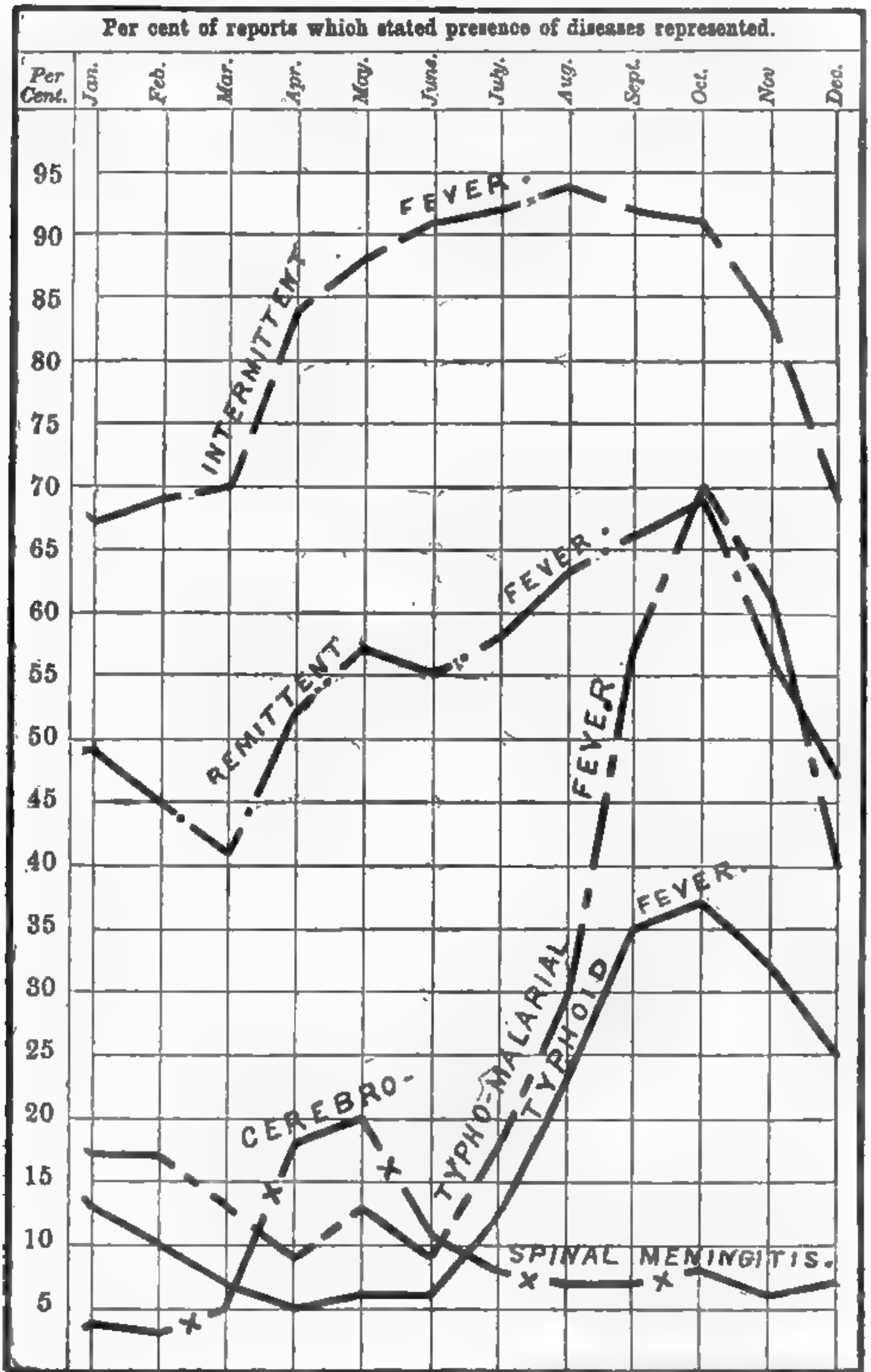
YEARS, ETC.	Ann. Av.	Months: Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 years 1877-81	55	43	43	44	46	53	56	61	70	71	69	56	50
1877	58	30	33	39	[illegible]	49	47	50	68	73	71	64	57
1878	59	55	53	52	45	43	56	63	69	79	73	56	46
1879	57	38	38	40	51	67	63	70	78	67	65	53	49
1880	56	43	47	47	53	55	59	62	70	72	66	50	49
1881 (See this line in Diagram 3.)	54	49	45	41	52	57	55	58	63	66	69	56	47
In 1881 Greater than Av. 1877-81	......	6	2	....	4	4		....	....	....	=	=	....
In 1881 Less than Av. 1877-81	1	....	....	3	....	....		3	7	5	....	....	[illegible]

TYPHOID FEVER.

EXHIBIT 70.—SICKNESS FROM TYPHOID FEVER, 1877–81.—*By Year and Months for each of the Five Years 1877–81. Stating on what Per Cent of the Weekly Reports received Typhoid Fever was reported Present, and comparing the Per Cents for 1881 with the Average for corresponding Months in those Years.*

YEARS, ETC.	Ann. Av.	Months: Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 5 Years 1877–81	14	11	9	6	6	6	6	8	16	24	25	23	18
1877	14	14	7	4	3	6	7	6	13	23	23	27	18
1878	10	12	9	7	4	7	6	6	10	13	18	11	13
1879	12	6	5	6	[illegible]	3	4	5	14	20	24	25	17
1880	14	8	13	7	3	6	5	10	19	26	23	22	17
1881 (See this line in Diagram 3.)	18	13	10	7	5	6	6	12	23	35	37	32	25
In 1881 Greater than Av. 1877-81	4	2	1	1	....	=	=	4	7	11	12	9	7
In 1881 Less than Av. 1877-81	......	....	....	....	1	....	....	....	....	....	....	....	....

DIAGRAM 3—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1881.



Designed by Henry B. Baker.

RELATIONS OF TYPHOID FEVER TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That **more** than the average per cent of weekly reports stated the presence of Typhoid Fever in months when the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average the year; and **less** than the average per cent of reports stated the presence of Typhoid Fever in months when these conditions were **less** than the average for the year. In Exhibit 69, below, the letter *a* marks exceptions to this proposition, for the year 1881.

Explanations of propositions 1 and 2 are given on page 540, and a summary of the evidence of Exhibit 69 is given in Exhibit 74, page 576.

PROPOSITION 2.—That **more** than the average per cent of weekly reports stated the presence of Typhoid Fever in months when the relative humidity of

EXHIBIT 69.—TYPHOID FEVER.—*Stating for the Year and for Each Month of the Year 1881, What Per Cent of the Weekly Reports of Diseases Stated Presence of Typhoid Fever, and What were the Meteorological Conditions as Observed at the Office of the State Board of Health, Lansing, Michigan, which is near the center of the thickly settled part of the State.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of Typhoid Fever †		Per Cent of Weekly Reports Stating Presence of Typhoid Fever †	Av. Order of Prevalence where Present †, ‡.	Temperature, Degrees F: Av. Daily Range, by Registering Thermometers, Observed at 7 A. M.	Temperature, Degrees F: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.*	Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M. Daily: Relative—Per Ct. of Saturation.	Humidity of Atmosphere: Absolute—Grs. of Vapor in a Cu. Ft. of Air	Vapor Inhaled and Exhaled, (Oz., Troy.): Vapor Inhaled by one Person in 24 Hours.‖	Vapor Exhaled from Air Passages in 24 H., in Excess of that Inha'd.¶	Av. Per Cent of Cloudiness.	Ozone,—Relative, Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 9 P. M.	Ozone: Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury. (Reduced to 32° F.): Range: Monthly, and for Year.	Range: Av. Daily, by Observations at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
Year 1881.		18	6.2	††112°	49.69	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	.186	29.01₇
More than Av. Per Ct. of Typh'd Fe.	Oct.	37	4.9	19.84	53.63	b75	3.94	2.46	9.22	b66	2.77	3.62	8.7	a.826	.206	29.039
	Sept.	[illegible]	5.3	22.55	71.33	65	5.50	3.49	6.19	45	b4.12	3.57	b10.3	a.654	a.150	a28.999
	Nov.	32	5.2	a15.57	a38.76	b74	a2.37	1.48	10.20	b67	3.57	b5.30	b14.6	[illegible]	.279	29.037
	Dec.	25	5.1	a12.65	a35.28	b75	a2.10	1.31	10.37	b62	3.30	3.77	b11.2	.947	.215	29.056
	Aug.	23	6.5	24.48	74.63	62	5.80	3.63	8.06	44	b4.45	3.53	7.0	a.577	a.106	29.063
Average.		18	6.2	19.64	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	.843	.156	29.017
Less than Av. Per Ct. of Typhoid Fever	Jan.	13	6.9	16.65	16.98	81	1.09	[illegible]	11.00	65	4.52	b.45	b7.8	a1.202	a.248	a29.077
	July.	12	8.3	a23.32	a75.41	b62	a6.08	3.80	7.88	b57	4.45	b4.10	b8.1	.527	.089	a29.035
	Feb.	10	8.9	19.61	24.27	80	1.40	.88	10.80	68	b9.75	5.54	11.0	a1.398	a.309	a29.071
	Mar.	7	8.0	14.68	30.59	78	1.76	1.10	10.55	62	4.32	6.00	10.4	a1.017	a.214	28.821
	May.	6	8.7	a24.10	a66.94	b61	a4.84	3.08	8.65	b52	b3.94	b4.26	b8.4	.707	.116	a29.038
	June	6	8.0	a21.43	a65.99	b67	a5.07	3.17	8.51	59	b3.73	4.80	b8.4	.541	.154	28.940
	April	5	9.2	a21.33	43.23	b64	2.49	1.56	10.12	b40	4.50	6.07	9.8	.717	.149	28.979

*, †, ‡, §, ‖, ¶, **, ††. See foot-notes, with these marks, in Exhibit 39, page 541.
a An exception to Proposition 1, relative to Typhoid Fever, above.
b An exception to Proposition 2, relative to Typhoid Fever, above.

the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and **less** than the average per cent of reports stated the presence of Typhoid Fever in months when these conditions were **greater** than the average for the year. In Exhibit 69, page 570, the letter *b* marks exceptions to this proposition for the year 1881.

What per cent of the weekly reports stated the presence of Typhoid Fever in each month in 1881, is graphically represented in Diagram 3, page 569.

What proportion of the weekly reports received stated presence of Typhoid Fever for the years 1877–81 is stated by months in Exhibit 70, page 568, where are also given an average for those years and a comparison of 1881 with that average. It may be seen that Typhoid Fever was unusually prevalent in September and October, 1881. And by Exhibits 11 and 12, page 454, it may be seen that the average temperature in September, 1881, was much higher than usual.

SICKNESS FROM ALL DISEASES.

Questions of considerable interest may now be answered as to what month in the year there is usually least sickness, considering all diseases; what year is found most favorable to health; and what are the meteorological conditions at such times of least sickness. The evidence, shown in Exhibit 72, page 572, is that during the five years 1877–81, June was, on the average, the most healthful month, and next to June the month of May was most healthful. By Diagram 5, page 573, the line of × × × ×, shows that the same statements were true respecting these months in the year 1881, but that December was not less favorable than May. Exhibit 71, page 574, will enable a person to study the meteorological conditions in these most healthful months. Propositions have also been made on pages 571-2, and exceptions to those propositions are noted by reference letters, *a* and *b*, in the Exhibit. These exceptions seem, in some instances to balance each other in a very interesting manner, as may be seen with respect to relative and absolute humidity. In order that these propositions shall hold true throughout the year, it would appear that they need to be reversed in winter and summer, or at least to take account of the great differences in the effects of certain conditions of atmospheric moisture, ozone, etc., which appear to depend upon the temperature which may be coincident with such conditions. In cold weather the danger seems to be in dryness, excess of ozone, and wind; while in warm weather the danger seems to be in moisture, in deficiency of ozone, and in the absence of sufficient movement of the air.

RELATIONS OF TOTAL AMOUNT OF SICKNESS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when the average daily range of temperature, the average daily temperature the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were **greater** than the average for the year, **more** than the average per cent of weekly reports stated the presence of such of the diseases tabulated (in tables on pages 524–33) as were reported present; and **less** than the average per cent of reports stated the presence of said diseases in months when those conditions were **less** than the average for the year. In Exhibit 71, page 574, the letter *a* marks exceptions to this proposition for the year 1881.

PROPOSITION 2.—That in months when the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year, **more** than the average per

cent of weekly reports stated the presence of such of the diseases tabulated as were reported present; and **less** than the average per cent of reports stated the presence of said diseases in months when those conditions were **greater** than the average for the year. In Exhibit 71, page 574, the letter *b* marks exceptions to this proposition for the year 1881.

What per cent of the weekly reports received in 1881 (on an average for such of the tabulated diseases as were reported present) stated presence of the diseases is graphically represented by months in Diagram 5, page 573.

EXHIBIT 72.—SICKNESS FROM AVERAGE DISEASE.—1877–81.—*By Year and Months for each of the five Years 1877–81, Stating on an average for such of the 26 diseases tabulated as were reported present, What Per Cent of the Weekly Reports received stated Presence of the Diseases, and comparing the average per cents for 1881 with the average for corresponding months in those Years.*

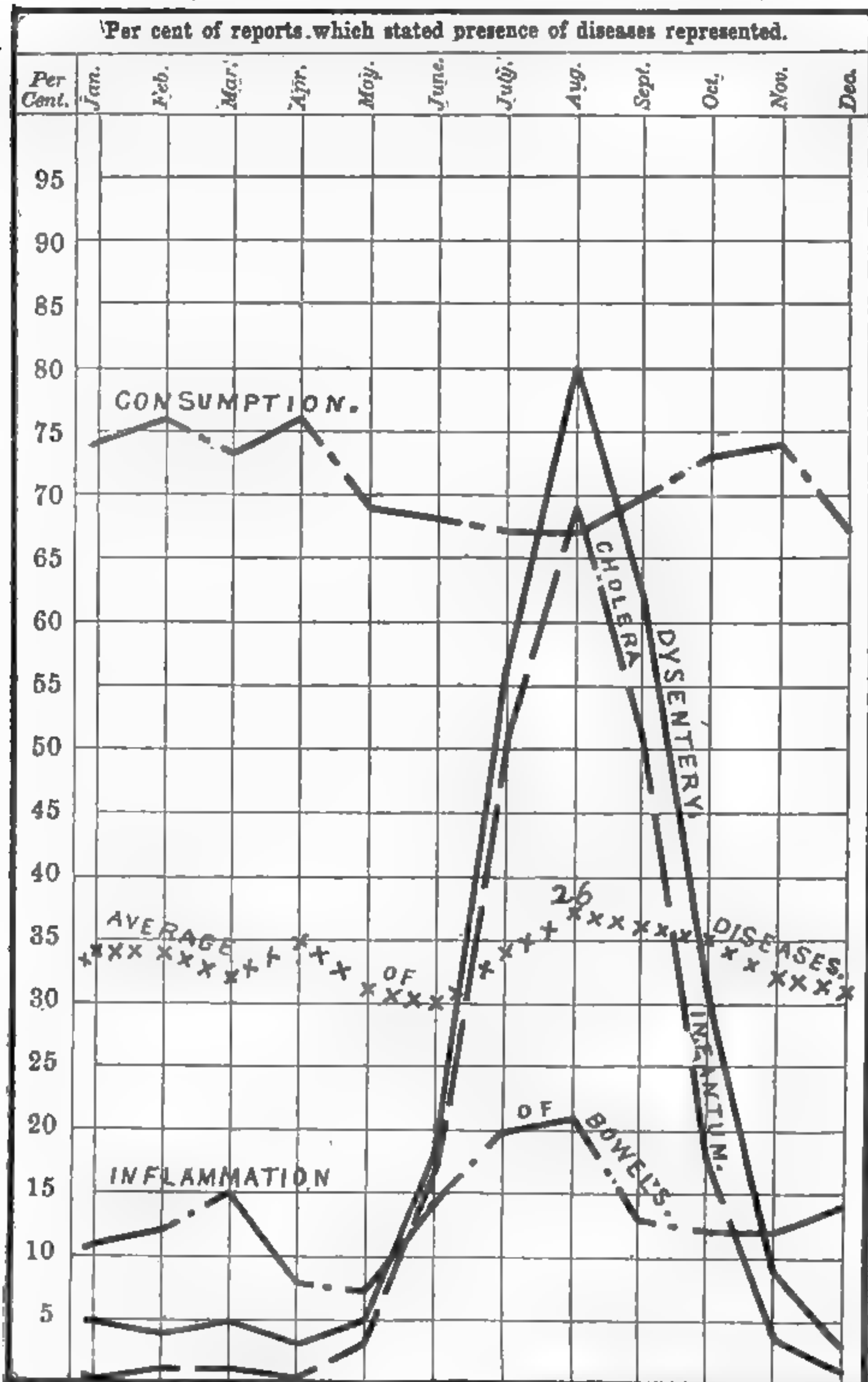
YEARS, ETC.	Ann. Av.	MONTHS.											
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 Years, 1877-81	31	32	32	31	31	29	28	31	34	35	33	31	31
1877	28	27	28	26	24	24	23	26	29	31	30	30	30
1878	30	30	30	31	29	28	26	28	32	35	31	30	33
1879	33	35	36	36	35	30	30	32	37	36	34	34	33
1880	32	32	33	32	31	30	31	34	36	35	33	30	31
1881 (see this line in Diagram 5)	33	34	34	32	35	31	30	34	37	36	35	32	31
In 1881 Greater than Average 1877-81	2	2	2	1	4	2	2	3	3	1	2	1	—

It may be seen, especially by referring to the diagrams, that quite a number of diseases seem to have increased in prevalence during the month of February, 1881. Among the most prominent of these, are pneumonia and inflammation of brain (shown in Diagram 1, page 516), influenza, diphtheria, scarlet fever, and membranous croup (Diagram 2, page 543), neuralgia (Diagram 4, page 557), consumption, and inflammation of bowels (Diagram 5, page 573).

By Table 1, page 520, as well as by Exhibits 42 (page 545), 44, 46 (page 547), 50 (page 550), 52 (page 552), 58, and 60 (page 560), the reported sickness from each of the diseases mentioned as having increased in prevalence in February, 1881, may be compared with the average for five years, and with the average for each of the five years 1877–81. Beginning with the month of January, it may be seen that these diseases were not as a rule lower (less prevalent) than usual in that month, so that the rise in February is real, and not merely because the lines representing these diseases were unusually low in January. When we study the month of February, another fact of similar import appears,—namely, that, compared with the average for the five years 1877–81, there was an unusual prevalence of most of these diseases, namely, of croup, diphtheria, neuralgia, scarlet fever, and pneumonia—in Feb., 1881.

The notable meteorological conditions coïncident with or immediately preceding this increased prevalence of certain diseases in February, 1881, seem to have been: the high relative humidity, shown by Diagram V., page 469, the great amount of fog, shown by Diagram IX., page 473, the unusual cloudiness, shown by Diagram VII., page 479, the excessive rainfall, shown by

DIAGRAM 5.—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1881.



Designed by Henry B. Baker.

Diagram X., page 483, the excessive ozone, as shown by Diagrams XII. and XIV., pages 489 and 491. The average temperature at the Agricultural College was in January (1881), 6° lower, and in February, nearly 3° lower than the average for corresponding months in the preceding seventeen years. The evidence of this may be found in Exhibit 11, page 454; and by Exhibit 12 on the same page it may be seen that comparing observations made at several stations in Michigan for the years 1877–81, the temperature in January and February, 1881, was much lower than the average for those years. By Exhibits 32 and 33, page 512, it may be seen that the average atmospheric pressure in February, 1881, was considerably higher than the average for that month in a period of years. Perhaps the most noticeable condition in February, however, was the great average velocity of the wind, shown by Diagram XVI.,

EXHIBIT 71.—AVERAGE DISEASE.—*Stating, for the Year and for each Month of the Year 1881, what Per Cent of the Weekly Reports of Diseases, on an Average for each of the 26 Tabulated Diseases as were reported present, stated presence of the diseases during the Year and during each Month of the Year 1881, and what were the Meteorological Conditions as observed at the Office of the State Board of Health, Lansing, Michigan, which is near the center of the thickly-settled part of the State.**

Months in Order of Av. Per Cent of Weekly Reports Stating Presence of Diseases Tabulated.		Av. Per Cent of Weekly Reports Stating Presence of Diseases Tabulated.†	Av. Order of Prevalence where Present †, ‡	Temperature, Degrees F.: Av. Daily Range, by Registering Thermometers, Observed at 7 A. M.	Temperature, Degrees F.: Av. of Daily Observations at 7 A. M., 2 P. M., and 9 P. M.	Humidity of Atmosphere.§ Av. of Observations at 7 A. M., 2 P. M., and 9 P. M., Daily: Relative—Per Ct. of Saturation.	Humidity: Absolute—Grs. of Vapor in a Cu. Ft. of Air.	Vapor Inhaled and Exhaled, (Oz., Troy.): Vapor Inhaled by one Person in 24 Hours.‖	Vapor Exhaled from Air Passages in 24 H., in Excess of that Inh'd ¶	Av. Per Cent of Cloudiness.	Ozone,—Relative, Scale of 10 Degrees of Coloration: Day Observation,—7 A. M. to 2 P. M.	Ozone: Night Observation,—9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour,—by Robinson's Registering Anemometer.	Pressure of Atmosphere. Inches of Mercury. (Reduced to 32° F.) Range: Monthly and for Year	Range: Av. Daily, by Obsvns. at 7 A. M., 2 P. M., and 9 P. M.**	Average Pressure.
Year 1881.		33	4.9	††112°	49.59°	70	3.54	2.21	9.47	54	4.00	4.66	9.6	1.402	.186	29.017
More than Av. Per Cent.	Aug. ..	37	5.3	24.45	74.63	62	5.80	3.63	8.05	44	b4.46	3.53	7.0	a .577	a .106	29.063
	Sept. ..	36	5.1	22.53	71.33	65	5.59	3.49	8.10	45	b4.12	3.57	b 10.3	a .654	a .150	a28.989
	April..	35	4.8	21.33	a43.23	64	a 2.49	1.56	10.12	46	b4.50	b 6.07	b 9.8	a .717	a .149	a28.978
	Oct.....	35	5.1	19.84	53.63	b 75	3.94	2.46	9.22	b 65	2.77	3.52	8.7	a.828	.206	29.069
	Feb....	34	5.0	a10.01	a22.27	b 80	a 1.40	.88	10.60	b 68	3.75	b 5.54	b 11.0	1.326	.302	29.071
	July....	34	5.1	23.32	75.41	62	6.08	3.80	7.88	37	b4.45	4.10	8.1	a .527	a .089	29.035
	Jan.....	34	4.7	a18.65	a16.98	b 81	a 1.06	.68	11.00	b 66	b4.52	b 5.45	7.8	1.202	.248	29.077
Average....		33	4.9	19.84	49.59	70	3.54	2.21	9.47	54	4.00	4.66	9.6	.843	.186	29.017
Less than Average Per Cent.	Mar.	32	4.9	14.68	30.59	78	1.76	1.10	10.58	62	4.52	6.00	10.4	a1.017	a .214	28.821
	Nov.	32	4.8	15.57	38.78	74	2.37	1.48	10.20	67	b4.57	5.30	14.6	a1.069	a.279	a29.037
	May.	31	4.8	a21.10	a56.94	b 61	a 4.84	3.03	8.65	b 32	b3.94	b 4.26	b 8.4	.707	.116	a29.038
	Dec..	31	4.3	12.53	35.28	75	2.10	1.31	10.37	62	b3.39	b 3.77	11.2	a .947	a.215	a29.056
	June	30	4.9	a21.43	a65.59	b 67	a 5.07	3.17	8.51	56	b3.73	4.90	b 8.4	.541	.184	28.940

*, †, ‡, ‖, §, ¶, **, †† See foot-notes with these marks, in Exhibit 39, page 541. It should be noticed that (for reasons stated in the last paragraph on page 537) small numbers in the "Av. Order of Prevalence" column in this exhibit indicate less rather than more sickness—reversing the rule stated in note c, on page 525, with reference to a single disease, or when one disease is compared with another.

a Exceptions to Proposition 1 on page 571. b Exception to Proposition 2, on pages 571-2.

page 502,—especially from about 8 to 12 o'clock P. M., in that month, as shown on Diagram XVII., page 501. But though in February, 1881, the wind was high, compared with months just preceding and succeeding, it was not so high as in February, 1880, as may be seen by comparing the second and third figure-columns in Table X., page 500, so that although the wind may have contributed to the increase of the diseases mentioned, that condition alone is not enough to account for their greater prevalence in February, 1881, than in preceding years.

Summarizing the evidence, it appears that certain diseases, which have been mentioned, increased, and that the principal conditions which probably contributed to the increased prevalence of these diseases, in February, 1881, were the low temperature, the fog, the wind, etc. That close relations exist

EXHIBIT 73.—*Summary Relative to Propositions contained in Exhibits 39, 41, 43, etc. (pages 541–561), concerning Relations, by Months in 1881, between Greater or Less than usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

DISEASES.	Months (inclusive) in which Diseases named were More than Usually Prevalent in 1881.	Months (inclusive) in which Diseases named were Less than Usually Prevalent, in 1881.	For the 12 Months of the Year 1881, Number of Months in which Propositions Hold True.* That Diseases named were More Prevalent than usual when the conditions named below were Greater than usual, and Less Prevalent than usual when these conditions were Less than usual.									That Diseases named were more Prevalent than usual when the conditions named below were Lower than usual, and less Prevalent when these conditions were Higher than usual.	
			For Av. Daily Range of Temp.	Relative Humidity.	Av. Per Cent of Cloudiness.	Ozone. Day	Ozone. Night.	Velocity of Wind.	Atmospheric Pressure. Range. Monthly.	Atmospheric Pressure. Range. Average Daily.	Atmospheric Pressure. Average Daily	Average Temperature.	Absolute Humidity.
Bronchitis.........	Jan. to April, Nov., Dec.	May to Oct....	*1	10	9	6	10	10	11	10	6	12	*12
Pneumonia........	Jan. to May, Dec.	June to Nov...	3	8	7	6	8	8	9	8	6	10	10
Membranous Croup.	Jan. to Mar., Nov., Dec.	April to Oct...	0	11	10	5	9	9	12	11	7	11	11
Diphtheria.	Jan., Feb., Oct. to Dec.	Mar. to Sept.	1	11	11	5	7	7	10	11	8	9	9
Tonsilitis....	Jan. to April, Nov., Dec.	May to Oct....	1	10	9	6	[illegible]	10	11	10	6	12	12
Influenza..........	Jan. to April, Dec.	May to Nov...	3	9	8	7	9	9	10	9	5	11	11
Scarlet Fever......	Jan. to May...	June to Dec...	4	7	6	7	9	7	8	7	5	9	9
Whooping Cough.	Jan. to Feb., July to Sept., Nov., Dec.	Mar. to June, Oct.	4	8	6	7	7	7	8	7	9	7	7
Rheumatism.	Feb., May, Nov.	Jan., June to Oct., Dec.	4	10	6	5	10	9	8	7	6	9	9
Neuralgia.........	Jan. to April, Nov., Dec.	May to Oct.. .	2	10	9	6	10	10	11	10	6	12	12
Pulmonary Consumption.	Jan to April, Oct., Nov.	June to Sept., Dec	8	10	9	6	10	9	9	10	8	10	10

* The figures in each of these eleven columns show for how many months, out of the twelve months in the year 1881, the proposition named holds true; thus for Bronchitis the proposition was true for only one month, so far as relates to average daily range of temperature; while the proposition relative to average temperature, and absolute humidity holds true in all the 12 months of the year.

between prevalence of neuralgia and a low temperature and low absolute humidity of the atmosphere is plainly shown in the first paragraph on page 559, and in Exhibit 57 on that page,—the proposition having held true for 24 consecutive months in 1880 and 1881, that there was more than the average sickness from neuralgia in months when the average temperature and the absolute humidity were below the average for the year, and less than the average sickness from neuralgia in months when these conditions were above the average for the year.

By Exhibit 46, page 547, it may be seen that *sickness* from diphtheria increased with considerable regularity from 1877 to 1881, inclusive. By the next to the last line, on page 168, it may be seen that the *deaths* from diphtheria increased with similar regularity, there having been over 2,000 deaths reported from this disease in Michigan in 1881. This increase of diphtheria from year to year, till it reaches its highest point, and then declines for a short period of years, is probably in great part independent of climatic conditions, and somewhat dependent on the number of susceptible children who may be exposed to the disease. When nearly all have had it or been exposed to it the disease dies down somewhat till a new generation of children have appeared to suffer its attacks. In so far as the disease is not restricted by

EXHIBIT 74.—*Summary relative to Propositions contained in Exhibits 61, 63, 65, 67, 69, (pages 562-570), concerning Relations, by Months in 1881, between Greater or Less than Usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

DISEASES.	MONTHS (INCLUSIVE) IN WHICH DISEASES NAMED WERE MORE THAN USUALLY PREVALENT, IN 1881.	MONTHS (INCLUSIVE) IN WHICH DISEASES NAMED WERE LESS THAN USUALLY PREVALENT IN 1881.	FOR THE 12 MONTHS OF THE YEAR 1881, NUMBER OF MONTHS IN WHICH PROPOSITIONS HOLD TRUE.*										
			That Diseases named were More Prevalent than Usual when conditions named below were Higher than Usual, and Less Prevalent when these conditions were Lower than Usual.						That Diseases named were More Prevalent than Usual when the conditions named below were Less than Usual, and Less Prevalent when these Conditions were Greater than Usual				
						Atmospheric Pressure					Ozone.		
						Range.							
			Av. Daily Range of Temperature.	Av. Temperature.	Absolute Humidity.	Monthly	Av Daily.	Av Daily.	Relative Humidity.	Av. Per cent of Cloudiness.	Day.	Night.	Velocity of Wind.
Diarrhea..........	June to Oct....	Jan. to May, Nov., Dec	*9	11	11	2	8	5	9	8	5	10	*9
Cholera Infan'm	July to Oct....	Jan. to June, Nov., Dec. ..	8	10	10	3	4	6	8	9	4	10	8
Intermittent F..	April to Nov..	Jan. to March Dec...	10	10	10	1	2	6	10	9	6	8	8
Remittent Fever	May to Nov....	Jan to April, Dec............	9	11	11	2	3	8	9	9	7	9	9
Typhoid Fever..	Aug. to Dec...	Jan. to July ...	5	7	7	6	7	7	5	6	7	9	6

* The figures in each of these 11 columns show for how many months out of the twelve months in 1881, the proposition named over the column holds true; thus, concerning diarrhea, the proposition relative to Av. Daily Range of Temperature held true in nine months out of the twelve; relative to Av. Temperature, in 11 out of 12, etc.

action of local health authorities, physicians and house-holders, it may be expected thus to increase and decrease by deriods of years.

By Exhibits 45 and 73 it may be seen that when studied by months or by seasons of the year, diphtheria has well-marked relations to climatic conditions; and this is true respecting many other contagious or communicable diseases.

Exhibit 73, page 575, presents a summary concerning propositions relating to bronchitis, pneumonia, etc., in Exhibits 39, 41, etc., on pages 540–561. By this it appears that the proposition concerning the relation of bronchitis to the average temperature and absolute humidity of the atmosphere (proposition 2, page 540), holds true in every month of the year 1881. Also that a similar proposition relating to tonsilitis and neuralgia holds true for every month of that year. Exhibit 74, page 576, presents a similar summary concerning other propositions relating to diarrhea, cholera infantum, etc., in Exhibits 61, 63, etc., on pages 562–70.

In the several Exhibits, pages 541–570, exceptions to the propositions are not infrequently fully or partially explained by evidences shown in columns relating to other meteorological conditions than that for which the exception is found; but it is difficult to summarize such evidence, and for such details the reader is referred to the several exhibits.

Respectfully submitted,

HENRY B. BAKER.

ALPHABETICAL INDEX.

[Localities in Michigan when not otherwise stated. Authors of papers, and not the State Board of Health, are responsible for statements in their papers; hence statements for which the Board are not responsible may appear in the index.]

ERRATA.

Page 42, 3d line of last paragraph, for *cow pasture* read *kitchen.*
Page 128, 3d line from bottom, for *ampitheater* read *amphitheater*.
Page 265, transfer the star (*) foot-note to bottom of page 264.
Page 361, 3d line, for *so that* read *in that.*
Page 370, first line of 3d paragraph, for *Antrim county* read *Huron county.*
Page 398, 4th paragraph, 10th line, after *was* read *figuratively set out*, etc.
Page 400, 5th line of 2d paragraph, for *unusual* read *usual.*
Page 445, 3d line, for *siuated* read *situated.*
Page 518, at bottom, read *Continued on page 522.*